Banking Relationships and first-day IPO Performance

- Evidence from ex-ante pricing of Swedish firms

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Abstract

The purpose of this thesis is to investigate how pre-Initial Public Offering (IPO) banking relationships affect the level of underpricing for Swedish firms. By studying a sample of 273 IPOs between 2014 and 2018, no support for a signaling effect that reduces information uncertainty for investors can be concluded since firms with a pre-IPO lending relationship do not experience a lower level of underpricing. By further investigating the type of bank the relationship refers to, the sample is narrowed to 122 IPOs, and empirical evidence is found that a previous relationship with a bank that could be employed as the firm's underwriter is associated with a significantly higher level of underpricing. Finally, we find no evidence that employing the existing relationship bank as the underwriter is related to a conflict of interest. The results thus indicate that having a relationship bank with a business scope that goes beyond lending is associated with a significant cost for the issuing firm in terms of money left on the table within the studied sample, regardless of whether the relationship bank underwrites the issue or not.

Keywords: Initial Public Offering, Underpricing, Information Asymmetries, Banking Relationships

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1. Introduction

Accessing the capital market by selling shares to the public is perceived as a significant milestone in a firm's evolution. The money raised is a critical source for reinvestments, funding of capital expenditures, essential acquisitions as well as to finance investments in research and development (Ritter and Welch, 2002). Thus, a positive initial return has consequences for firms going public since it lowers the proceeds needed to support growth and instead transfers wealth to new shareholders (Lu, 2017).

The underpricing of IPOs is a well-established anomaly, and the term is used interchangeably with the first-day return of the issuing firm (Ritter, 1991). However, the explanation is rather a puzzle that has intrigued scholars for decades, where research has mainly focused on the explanatory power of information asymmetries between the issuing firm, the underwriter and outside market investors as the primary underlying source (Ritter & Welch, 2002). There are still areas of concern due to the complexity of the matter and the link to pre-IPO banking relationships is one of the topics which has been far from exhausted.

Relationship banking is defined as a relationship where non-public, firm-specific information can be exploited to benefit both participating sides. The bank attains proprietary information about the client firm over time, across several interactions or different products (Boot, 2000). Consequently, Boot (2000) shows that relationship banking adds value to both parties, mainly through the long-term nature of the relationship. Thus, having an earlier relationship with an underwriter certainly has implications for the IPO firm and has been argued to impact the level of underpricing, as it mitigates the problem of asymmetrically informed IPO parties (Schenone, 2004).

However, previous research has revealed contradicting results regarding whether a conflict of interest or a certification effect is prevailing when a bank with close ties to a firm also underwrites the shares issued. The research has to a large extent covered market-based financial systems in the United States, United Kingdom, and Canada (e.g., Puri, 1996; Schenone, 2004; Benzoni & Schenone, 2009; Hebb & Fraser, 2003; Hebb & Fraser 2002), and more empirical evidence has explicitly been asked for (Klein, Wuebker & Zoeller, 2016). Hence, this thesis aims to contribute with additional empirical evidence to these previously inconsistent findings with data from Sweden. By examining pre-IPO banking relationships in a rather unexplored context, one where banks are the primary source of finance (Marklund, 2016) and to a great extent engage in relationship banking (Gunnarsdottir & Lindh, 2011), we highlight the role of financial intermediaries in general and their business scopes in particular, a topic that is frequently debated around the globe in wake of the recent financial crisis (Lu, 2017).

To the best of our knowledge, no previous study has yet investigated the interconnection between underpricing and relationship banking in Sweden. Hence, this paper aims to fill the research gap and facilitate a greater understanding of whether pre-IPO banking relationships have a significant impact on the level of underpricing for firms going public on the Swedish equity market.

To investigate the effect of relationship banking on the IPO underpricing, a dataset of IPOs conducted on Nasdaq and Spotlight between 2014 and 2018 is used. Three

hypotheses are examined and tested by performing a univariate analysis and later complemented with OLS regressions to examine the impact of other well-known factors affecting the level of first-day returns (Puri, 1996; Aggarwal, Krigman & Womack, 2002). The first hypothesis examines whether a pre-IPO lending relationship affects the level of underpricing. Contrasting previous research, arguing that such a relationship signals to investors that the firm is of high quality which should reduce the level of underpricing (Slovin & Young, 1990), no significant result is found. Secondly, firms with a universal relationship bank are compared to non-universal relationship banks. Schenone (2004) finds empirical evidence that firms with a pre-IPO relationship bank that could underwrite the equity reduces informational frictions between involved IPO parties and thereby results in lower levels of underpricing. Contrary to Schenone (2004), we find that firms with a universal relationship bank experience a significantly higher level of underpricing. Thus, such a relationship does not seem to have a mitigating effect on information asymmetries between IPO stakeholders within the sample. Lastly, firms that went public with their pre-IPO relationship bank are compared to firms that did not, where previous studies have found contradictory results. One part of the finance literature supports a certification effect that implies lower underpricing levels (Benzoni & Schenone, 2009; Kroszner & Rajan, 1994; Puri, 1996). The other part of the research body favors a conflict of interest effect, where investors need to be compensated for the risk of receiving lemons when proprietary information from prior relationships can be used to share the risk of default with the market, resulting in higher underpricing levels (Kanatas & Qi, 2003; Klein et al., 2016). However, no significant difference in the level of underpricing can be confirmed within the sample to support either theory.

The implication of this thesis is twofold. First of all, neither a pre-IPO lending relationship, universal banking relationship, nor a relationship with the underwriter reduces the level of underpricing for the firms studied. Thus, banking relationships within the sample does not seem to convey any additional information to investors when they are determining the quality of an issuing firm before subscribing to the IPO. A potential explanation to these findings could be that the Swedish stock market, in general, is subject to rather low informational frictions, which would be supported by the fact that the Swedish market is associated with a lower average level of underpricing in the later years when contrasted to previously researched equity markets (Abrahamson & de Ridder, 2015; Loughran, Ritter & Rydqvist, 2018).

Second, firms with a universal relationship bank prior to the IPO is associated with a significantly higher level of underpricing compared to firms served by a non-universal relationship bank, which contradicts the findings of previous research. The results show that firms with a pre-IPO universal banking relationship experience underpricing levels that are 10 percentage points higher, compared to firms served by a non-universal bank. A significant finding that, on average, translates to SEK 81.94 million that is being left on the table by the issuing firm. Furthermore, since no previous theories support this significant finding, we would argue that these results potentially could be explained by omitted variables, such as specific institutional investments or the ownership structure of the issuing firm.

2. Previous Literature, Research Question and Hypotheses

Below, the existing literature and empirical evidence on IPO underpricing are investigated. The focus is further narrowed down to the theories concerning relationship banking and IPO underpricing. Thereafter, the research question and hypotheses are presented, based on the theoretical framework and previous research.

2.1. IPO Underpricing

Accessing the public capital market by conducting an IPO is perceived as a significant milestone in a firm's evolution. The money raised is a critical source for funding capital expenditures and acquisitions, as well as to finance investments in research and development (Ritter and Welch, 2002). Thus, a positive initial return has financial consequences for the IPO firm. It lowers the proceeds firms need to reinvest and grow and instead transfers wealth to new shareholders. *The money left on the table* is defined as the difference between the first-day closing market price and the offer price times the number of shares sold, and is averaging USD 9.1 million for the firm going public (Loughran & Ritter 2002). Thus, underpricing is often considered as a large cost associated with the IPO process, because of the considerable sum of proceeds that is forfeited (Loughran & Ritter, 2002).

The level of underpricing has varied considerably across industries (Ritter, 1991). Loughran and Ritter (2004) have provided evidence in support of this, concluding that firms within the technology industry have experienced a higher level of underpricing historically. The authors also show that underpricing has varied across time, where the internet bubble between 1999-2000 exemplifies a period with significantly higher IPO underpricing levels. During this period, firms went from maximizing IPO proceeds to maximizing research coverage and future benefits. At the same time, numerous firms had complex internet-based business models which implied higher uncertainty regarding their valuations.

The geographical difference is also noticeable, where scholars have found significant variation in underpricing spanning from 4.2 percent in Argentina during 1991-2013 to 270.1 percent in the United Arab Emirates in the years 2003-2010 (Loughran, Ritter & Rydqvist, 2018). When looking at evidence from the US over the last 50 years, the average IPO has been underpriced by 16.8 percent, which translates to more than 125 billion USD in lost proceeds for issuing firms (Lu, 2017). Considering Sweden, research by Rydqvist (1997), later complemented by Abrahamson and de Ridder (2015), find first-day returns for 405 Swedish firms between 1980-2015 averaging 25.9 percent. Investigating more recent IPOs conducted in 1996-2011, Swedish firms have experienced average IPO underpricing of 7.68 percent (Abrahamson & de Ridder, 2015), spanning in the lower range of the countries presented by Loughran et al. (2018).

The high uncertainty regarding the issuing firm's value has economic implications and affects all IPO participants in different ways over time, across industries and geographies. Thus, the subject has caught scholar's attention for decades, and the

underpricing anomaly of new issues has been analyzed through an assembly of theories, that are not mutually exclusive. However, the largest part is focusing on asymmetric information and it should be noted that a given theory has been found more applicable to some initial public offerings than to others (Ritter & Welch, 2002).

2.2. IPO Underpricing Theories

Ibbotson (1975) was one of the first authors to identify IPO underpricing as a widespread phenomenon and laid the foundation for the theoretical explanation as to why the anomaly exists. Other authors have since strengthened this foundation through extensive research of the topic, and a vast amount of theories, mainly concerning asymmetric information and allocation of shares, has emerged (Ritter & Welch, 2002). It should be noted that in line with the many existing theories, multiple factors affect the underpricing levels. Despite the many influential factors, researchers have affirmed that theories related to information asymmetries and the allocation of shares have substantial explanatory power of the anomaly (Ljungqvist, 2007; Rock, 1986). Throughout this thesis, the primary focus will be on asymmetrically informed IPO stakeholders and the potential effect on the level of underpricing of having a bank-firm relationship before going public.

2.2.1. Asymmetric Information Theories

According to the most prominent theories and explanations having robust empirical support, asymmetric information is to blame for the underpriced shares when a company goes public. The logic of the theories is that if no asymmetric information existed, i.e., all IPO parties were equally informed, the underpricing anomaly should be non-existent at all times since the up-front compensation to participants being more or less informed about the intrinsic value of the issuing firm would be uncalled-for (Schenone, 2004). Theories trying to explain underpricing are predominantly focused on informational frictions between informed and uninformed investors (Rock, 1986), between the underwriter and informed investors (Benveniste & Spindt, 1989) and between the IPO firm and uninformed investors (Allen & Faulhaber, 1989). In the model first presented by Rock (1986), one random group of investors with superior knowledge about firms' financials is distinguished from one group of investors without such information. Due to the advantage held by the informed investors, they would only demand shares in high-quality issues, whereas uninformed investors would bid and participate in all available IPOs. As a result, the uninformed investors would be allocated a small fraction of well-performing shares and a large proportion of shares in overvalued and overpriced IPOs. Hence, the uninformed group would on average earn a negative return on the investment and lose money; a scenario referred to as the "Winners Curse" (Thaler, 1988). Consequently, the negative first-day return would eventually discourage uninformed investors from subscribing to new issues and prevent them from participating in the offering. However, the solely partaking of informed investors alone is not enough to clear the IPO market, and the resulting excess supply would be costly for the underwriter

selling the shares. Thus, to ensure the participation of uninformed investors, the discounted offer price is rationally used to compensate less informed market participants (Rock, 1986).

Another well-established theory arguing that asymmetrically informed IPO players are the fundamental cause of initial first-day returns is the book-building model, introduced by Beneveniste and Spindt (1989), and later extended by Benveniste and Wilhelm (1990). The critical aspects of this framework refer to the information advantage held by institutional investors because of their recurring involvement in the IPO market, where the underwriter is assumed to be uninformed about the true firm value. After estimating a preliminary offer value, the underwriter will launch a roadshow to market the issue to potential institutional investors and collect information about their valuation, which ultimately should enable the underwriter to price the issue accurately. When the institutional investors reveal information about what they are willing to pay during the ongoing book-building process, they are later compensated for disclosing this valuable information through deliberately underpriced shares (Beneveniste & Spindt, 1989).

2.2.2. Theories Based on the Allocation of Shares

The allocation of shares during an IPO has been subject to public scrutiny due to the perceived unfairness where institutional investors attain advantages through being allocated more shares than retail investors in offerings with high demand, referred to as hot IPOs (Hurt, 2004; Schwartz, 2015). The theories investigate who is allocated shares when the issue is oversubscribed, and how it depends on prior relationships with the underwriter of the issue (Ritter & Welch, 2002). Underwriter's prior relationships with institutional investors have been argued to imply a disadvantage for certain investors since underwriters can offer higher underpricing to preferred clients by offering shares in hot IPOs (Loughran & Ritter, 2002). The fact that institutional investors are prioritized above retail investors in oversubscribed IPOs has been proven in numerous papers (Aggarwal, Prabhala & Puri, 2002; Cornelli & Goldreich, 2003; Hanley & Wilhelm, 1995; Lee, Taylor & Walter, 1996). It should also be noted that institutional investors might have legal or portfolio restrictions that limit their investments to certain types of offerings, for instance, connected to the type of stock exchange or a minimum size of the investment (Hellman, 2000). Thus, the presented theories in this section should be most relevant for firms that present a specific type of characteristics, such as larger firm size.

Brennan and Franks (1997) present another perspective on the matter; by allocating shares to chosen investors, management can retain their control and avoid external investigations. Through allocating small shares of stock to investors and allowing no large ownership stake, management can stay in charge, which introduces a free-rider problem where sub-optimal levels of scrutiny are employed (Shleifer & Vishny, 1986). Thus, it becomes too expensive for investors to oppose the management given their smaller ownership stakes, which diminishes the risk of a hostile takeover (Grossman & Hart, 1980). Thereby, issuing companies can use the allocation of shares as a takeover defense (Booth & Chua, 1996; Mello & Parsons, 1998). As a result, managers can retain control and continue to maximize their wealth through strategically

allocating shares. The opposite mechanism has also been found in previous research, i.e., that the allocation of shares can be used to increase the value of the company through bringing in institutional investors that control the management's behavior (Stoughton & Zechner, 1998).

2.2.3. Signaling Theory

Building on the theory of asymmetric information, a large amount of research has emerged focusing on the signaling aspect of underpricing (Welch, 1989; Allen & Faulhaber, 1989; Jegadeesh, Weinstein & Welch, 1993). The researchers investigating signaling theories argue that companies use underpricing to mitigate ex-ante uncertainty and signal high quality to attain benefits onwards (Welch, 1989). Based on the research of Welch (1989) as well as Cliff and Denis (2004), these future benefits are connected to better valuations at future seasoned equity offerings (SEOs) and more extensive analyst coverage. There are three caveats for the signaling to be effective; the signal must be observable for investors, take place before the IPO, and it must be demanding enough for low-quality firms to restrict them from using it (Certo, Daily & Dalton, 2001).

There are also other ways to signal high quality. Barry, Muscarella and Vetsuypens (1991), show that the qualitative monitoring venture capital (VC) firms provide is acknowledged by investors and reflected in a lower underpricing of these IPOs. A pattern confirmed in more recent studies (Belghitar & Dixon, 2012). Furthermore, Mogilevsky and Murgulov (2012) showed that private equity (PE) backed IPOs were, on average, less underpriced compared to non-sponsored IPOs. This is supposedly due to the decreased ex-ante risk for investors implied by the insurance a PE-owned firm provide, i.e., there is a certification effect of high quality for investors (Ferretti & Meles, 2011), as they believe that a PE firm would not invest in a firm of low quality.

2.3. Relationship Banking

One of the fundamental purposes of banks is quantitative asset transformation, since the bank's asset side is mainly illiquid, in the form of long-term loans that are funded through liquid deposits with a contrasting time frame (Greenbaum & Thakor, 1995). The reason for the illiquidity of loans is mostly contributable to information asymmetry, and the presence of these frictions may be one of the main reasons for the existence of banks (Bhattacharya & Thakor, 1993). The access of such proprietary information through the process of establishing a relationship with a client firm to assess if it is valuable to provide credit, is to a large extent linked to relationship banking (Boot, 2000).

Relationship banks are defined as intermediaries that provide financial services, and invests in obtaining proprietary information about the customer, and assesses the profitability of the investments across several interactions with the customer (Boot, 2000). This information can be gathered over time or across products, or both (Boot, 2000). By this definition, both exclusive information and contact over several occasions characterize the relationship. The bank gathers this exclusive information through the costly process of screening. Thus, the proprietary information must remain exclusive to

the bank, or else the screening process would be unprofitable to perform (Berger, Klapper & Udell, 2001). Furthermore, relationship banking is particularly relevant when looking at the Swedish market, due to the convention of Swedish banks engaging in relationship banking and the large fraction of Swedish firms being debt financed (Gunnarsdottir & Lindh, 2011).

Inherently, relationship banking is accompanied by several advantages (Boot, 2000). The proprietary information can be utilized to allow less rigid contracting, and thereby facilitate long-term relationships (Boot, Greenbaum & Thakor, 1993). Because of the possibility of renegotiation, extensive covenants can be included that handles conflicts of interest and reduce the amount of costly monitoring, through guiding the relationship (Boot, 2000). The moral hazard and adverse problems related to lending can be further mitigated through the usage of collateral (Besanko & Thakor, 1987). Furthermore, the long-term nature of relationship banking might allow funding of de novo companies, which might be unprofitable in the short term but profitable in the long run (Petersen & Rajan, 1995). The benefits of relationship banking have been argued to be particularly evident for Swedish banks, due to their close relations with the borrowing firms, which allows early intervention if there would be any sign of financial distress for the company (Strömberg & Thorburn, 1996).

In contrast, several drawbacks connected to relationship banking has also been identified. The soft budget problem, where borrowers realize the reluctance to recognize losses for the bank, and thereby demand write-down of the debt, or further lending, which puts the lender in a difficult position (Bolton & Scharfstein, 1996). The second issue is the hold-up problem, which implies that the relationship bank can charge a higher rate due to the lack of alternatives for the borrowing company (Rajan, 1992; Sharpe, 1990).

2.3.1. Universal Relationship Banks

Previous research has not always considered that universal relationship banks, through their business scope, have different preconditions compared to non-universal relationship banks. The definition of universal banking concerns a financial intermediary, in the form of a bank, that performs a range of financial services, spanning from deposit-taking, asset management, derivatives trading, and lending, to underwriting the issuance of new equity (Saunders & Walter, 1994). Hence, universal banks differ from retail banks and specialist banks by being able to provide products across different scopes and combine commercial banking with investment banking (Saunders & Walter, 1994). Previous literature has investigated the effect of the business scope of universal banks and shown that information obtained across loan and other non-loan services impact the bank's ability to finance firms due to the decreased uncertainties regarding the firm's prospects (Neuhann & Saidi, 2018). Amongst others, the authors show that universal banks take younger, riskier, and more productive firms public, due to the informational economies of scope. Thus, while both universal and non-universal banks can be defined as relationship banks, there are important distinctions and differences between the business models employed.

2.4. Relationship Banking and IPO Underpricing

2.4.1. Pre-IPO Relationship with a Lending Bank

When uncertainty is present regarding the true value of an issuing firm, outside investors will turn their attention to credible signals that lower the degree of doubt (Welch, 1989; Allen & Faulhaber, 1989). Bank-firm relationships fill that role. Inside debt and lending relationships provide a reliable signal regarding the creditworthiness and quality of the firm that is considered especially important when issuing junior claims (Beatty & Ritter, 1986). Building on that conclusion, Slovin and Young (1990) test if the existence of bank-firm relationships signals high quality to financial market participants at the time of an IPO. Because banks provide the function of screening and monitoring, the prevailing ex-ante uncertainty should be reduced, and the authors find a significant negative relationship between the presence of a banking relationship and the initial first-day return. James and Wier (1990) further investigate what kind of implications a borrowing relationship has on the cost of going public. Empirically, they find that a pre-IPO bank-firm relationship results in shares being severely less underpriced compared to when no such relationship exists. More recently, Hao, Shi and Yang (2014) investigates the implications of loan agreement disclosure in the IPO prospectus and document a significant negative correlation between bank-firm relationships and IPO underpricing.

In addition to providing investors with credible signals about the quality of the firm, banking relationships also mitigate markets frictions, in terms of asymmetric information, between the firm and the lender. During the process of screening and monitoring, soft data is collected regarding the competence and trustworthiness of managers, the ability to reach growth and profit targets and proprietary information about prior projections (Rajan, 1992). Developing on this theme, Petersen and Rajan (1995) find that availability of financing increases for firms when close ties and relationships are built with an intermediary. Furthermore, scholars have shown that lenders can establish a valuable reputation for making the right decisions whether to renegotiate loan terms or liquidate a borrowing firm due to financial distress (Chemmanur & Fulghieri, 1994). This desirable reputation creates incentives to allocate resources to follow and monitor the activities of the borrower to be further able to make adequate decisions, which ultimately strengthen the signaling mechanism used by investors when deciding to invest in an IPO (Chemmanur & Fulghieri, 1994).

To conclude, consensus seems to be reached among scholars regarding the important role of a banking relationship when a firm goes public. The relationship mitigates the problem of asymmetric information between the firm and the lender and is primarily interpreted as a signal of high firm quality by investors since low-quality firms would not be approved for bank funding. Accordingly, investors are willing to pay a higher offer price for firms with a pre-IPO banking relationship, resulting in a lower level of underpricing and a smaller amount of money left on the table by the issuing firm.

In traditional theories aiming to explain the underpricing anomaly as a result of asymmetric information, the underwriter is assumed to be uninformed about the IPO firm's true value (Rock 1986; Benveniste & Spindt 1989; Allen & Faulhaber, 1989).

However, in the sections below we investigate the effect on underpricing when the relationship bank is of a universal sort, i.e., when the bank can combine the information obtained from prior lending agreements with underwriting abilities.

2.4.2. Pre-IPO Relationship with a Universal Bank

Schenone (2004) hypothesizes that if market participants know that the issuing firm has a relationship with a universal bank prior to the IPO, the asymmetric information explanation behind the underpricing anomaly is no longer valid, and a lower initial return should be expected. In this situation, uninformed investors in Rock's (1986) model do not require any compensation for competing with informed investors since they know that the IPO price set by the relationship bank is accurate and thoroughly informative. The underwriter will not need to compensate institutional investors for the disclosure of private information about the issuing firm, as in the book-building theory by Benveniste and Spindt (1989), because that same information is now in the underwriter's possession. Finally, firms of high value will not need to leave money on the table to signal their superior quality and convince investors to pay higher prices for their seasoned offerings in the future, as in Allen and Faulhaber (1989), since the quality of the firm will be revealed to the market anyway. Furthermore, Schenone (2004) argues that what matters for the information asymmetries to be reduced is only dependent on the pre-IPO relationship bank's underwriting abilities, and not if the bank underwrites the IPO. This is because high-quality firms are assumed to go public with their pre-IPO relationship bank in possession of proprietary information, while low-quality firms have incentives to switch to an uninformed bank and try to receive a higher valuation. Since the uninformed bank has a reputation at stake that would be seriously harmed if it sells a firm for more than it is worth, the bank is assumed to price and value all approaching firms as low-quality firms. Consequently, the low-value firms will be indifferent between staying with the relationship bank and switching. In either way, the firm quality is revealed to the market, resulting in reduced information asymmetries and lower underpricing levels for both low- and high-quality firms. Schenone (2004) finds empirical evidence for her claim and shows that firms with a pre-IPO banking relationship with a potential underwriter face a significantly lower initial return compared to firms without such an established relationship.

2.4.3. Pre-IPO Relationship with the Underwriting Bank

Scholars have also examined how universal banks in possession of firm-specific, proprietary information due to previous lending relationships impact the level of underpricing when the bank de facto underwrites the issue. However, empirical evidence is contradictory, and no consensus has yet been reached (Klein et al., 2016). Several researchers argue that the informational advantage makes the underwriter prone to act as a certifier of high-quality issues. Opposing theories argue that the superior knowledge can facilitate agency problems and incentivize hazardous actions where the underwriting bank might try to transfer its loan risk to uninformed market participants by promoting

low-quality issues, referred to as lemons (Akerlof, 1970). Thus, two opposing views have emerged in the literature when a relationship bank is also the actual underwriter, entitled the certification effect theory (Puri, 1996) and the conflict of interest theory (Benston, 1990).

The Certification Effect Theory

Because of the firm-specific proprietary information obtained through prior financial interactions, a relationship bank can more precisely price a client's securities and is thus able to provide better certification of the true firm value, compared to when an uninformed bank underwrites the IPO (Benzoni & Schenone, 2009). Puri (1996) provides a theoretical model that shows that prior financial claims held by relationship banks during an IPO enable better prices for the underwritten securities compared to when specialized investment banks handle the offering. The author shows that relationships between a firm and an intermediary affect the pricing of the equity issue in favor of current shareholders, as the cost of going public decreases when less money is left on the table. Similarly, Kroszner and Rajan (1994) find that banks that obtain firm-specific information through prior relationships enable higher offer prices when underwriting more information-sensitive securities, compared to investment banks. Puri (1996) finds empirical evidence that supports the certification effect theory, as investors are willing to pay higher prices for junior claims underwritten by banks with greater knowledge.

The Conflict of Interest Theory

As a result of the performed monitoring, advising, and screening, the bank may discover that the firm is in financial distress. Because of the outstanding loan agreement, the relationship bank has incentives to indulge in risk-shifting activities and can be tempted to underwrite securities to use the proceeds to repay the senior claims and reduce exposure to the troubled firm (Gompers & Lerner, 1999). Thus, outside investors are fooled into buying overpriced shares. Since the market is assumed to be rational, investors will require a higher initial return to compensate for this potential risk of receiving lemons and an inherent conflict of interest results in more underpriced issues underwritten by inside banks. The empirical evidence of Klein et al. (2016) is in line with the conflict of interest theory. The authors ask if affiliated banks underwritten IPOs performs differently from firms taken public by specialized investment banks, and finds that relationship banking is correlated with higher first-day returns. A similar conclusion is drawn by Ber, Yafeh and Yosha (2000) when comparing initial public offerings with and without a loan relationship between the underwriter and issuer the year before the IPO. Empirical evidence shows that the information advantage is used to underwrite equity of low performing firms on the stock market and the results suggest a conflict of interest when different banking activities are combined. Furthermore, Kanatas and Qi (1998) argue that banks that both lend and simultaneously act as the underwriter are faced with a conflict of interest that ultimately imposes a cost on the client firm when seeking to raise funds as the underpricing increases.

2.5. Research Question and Hypotheses

This thesis investigates how the presence of a pre-IPO banking relationship influences the level of underpricing in the Swedish equity market. Previous research on the topic is limited, rather contradictory and more empirical evidence has explicitly been asked for (Klein et al., 2016). To the best of our knowledge, no previous study has investigated the subject using data from Sweden; hence, we seek to fill this gap with the aim to answer the following research question:

- *How do pre-IPO banking relationships affect the level of underpricing for Swedish firms?*

To answer the research question, three hypotheses have been formulated based on theories and empirical evidence outlined, which suggests that the existence of bank-firm relationships affects the amount of money left on the table by the issuing firm.

The first hypothesis investigates the level of underpricing by comparing firms with and without a banking relationship, defined as having a lending agreement prior to the IPO. In line with previous research that has argued in favor of a signaling effect, we expect a lower degree of underpricing, since the ex-ante uncertainty for outside investors should be reduced (Slovin & Young, 1990). Hence, we formulate the following testable prediction:

- Hypothesis 1: *Firms with a pre-IPO lending relationship experience a lower level of underpricing than firms without such a relationship*

Furthermore, previous literature argues that asymmetric information motivates the discounted offer prices as different market participants need to be compensated for informational frictions related to the true firm value during the IPO (Schenone, 2004). However, when the firm has a pre-IPO relationship with a bank that ***could*** underwrite the equity, market participants do not require the same extensive compensation for being unequally informed (Schenone, 2004). Accordingly, the second hypothesis investigates the level of underpricing when the pre-IPO bank is the lender and also have underwriting abilities, i.e., a universal bank holding proprietary information about the issuing firm. Based on previous research that argues for a reduction of asymmetric information resulting in a lower level of underpricing, we formulate the following:

- Hypothesis 2: *Firms with a pre-IPO relationship bank that could take the firm public experience a lower level of underpricing*

Finally, we aim to examine the scenario when the underwriter in possession of superior, firm-specific knowledge ***did*** take the firm public, where previous research has found contradicting evidence. Some scholars argue that the bank with proprietary information, generated through prior lending agreements can bridge the information gap between the firm and investors by better certifying the quality of the issuing company (Puri, 1996). In line with the certification effect theory, a negative correlation between being underwritten by a relationship bank and underpricing has been found. Others have argued

that the bank faces incentives to facilitate the IPO of a firm in financial distress if the purpose of the proceeds is to pay back the senior claims. In line with the conflict of interest theory, a positive relationship between underpricing and being underwritten by a pre-IPO bank can be expected (Kanatas & Qi, 1998). Following Kanatas and Qi (1998), we suggest that a conflict of interest is implied when a firm employs the relationship bank as their underwriter. Thus, the hypothesis we aim to examine is the following:

- Hypothesis 3: *Firms that employ the pre-IPO relationship bank as their underwriter experience a higher level of underpricing*

To test the hypotheses defined in this section, our main sample is divided into different subgroups. Examining the first hypothesis, the sample is divided into two groups, one with a pre-IPO banking relationship in terms of lending agreements and one without. Secondly, among firms with a lending relationship, a subsample is created and separated into two groups consisting of firms associated with a bank that has underwriting abilities, and firms that are not. Finally, examining the third hypothesis, we split the same subsample used to test the second hypothesis to investigate the difference in underpricing levels for firms that de facto employs their relationship bank as the underwriter and firms that do not.

3. Data and Methodology

The following section explains the process of selecting the sample and gathering and compiling the data. Thereafter, the different variables are introduced, clarified, and motivated. Lastly, the methodology is presented.

3.1. Data

3.1.1. The Scope of the Thesis

To be able to investigate whether the presence of pre-IPO banking relationships affects the level of underpricing for Swedish firms, recent IPO data spanning from January 1, 2014, to December 31, 2018, has been examined. The chosen time frame has been studied, since no previous research to the best of our knowledge, has considered this relationship deploying such recent data. Furthermore, the data is limited to Nasdaq and Spotlight Stock Market. Finally, financial institutions and real estate companies are excluded from the scope, which is in line with previous research on the subject (Schenone, 2004; Benzoni & Schenone, 2009), as they have inherent differences compared to other industries included in our study and hence cannot be rightfully compared to these industries.

3.1.2. Data Sources

The Swedish IPO data, consisting of IPO date, offer price, and the name of the underwriter was initially gathered through the Thomson's Financial Securities Data

Company (SDC) Platinum Database. However, the data proved to be insufficient when compared to a list of all IPOs provided by Nasdaq and Spotlight. Therefore, all missing data points were manually collected from firms' IPO prospectuses. The first-day closing price was manually obtained from Nasdaq and Spotlight and subsequently cross-checked to the closing price presented by Avanza, aiming to confirm its accuracy. Data for the independent variables and control variables were collected from the IPO prospectus of each company, following the methodology used in previous research (Schenone, 2004). When the IPO prospectus did not provide the relevant information, firm-specific data was collected from the database Retriever. Based on the information provided in the IPO prospectus, the firms were classified into industry groups by following the Global Industry Classification Standards (GICS), the industry taxonomy and classification framework used by the global financial community (S&P Global, 2018).

3.1.3. Data Collection

The data collection process generated an initial dataset of 527 IPOs and was after that adjusted according to the following exclusion criteria:

1) The listing was not an initial offering, but rather a list change, rights offer, bond offer or a spin-off
2) The IPO prospectus could not be obtained, typically because the firm had been delisted or liquidated
3) It was impossible to find an offer price, either because the company used a floating price or because the price was not available in the IPO prospectus

Above restrictions limited the sample to 323 data points. Thereafter all companies classified as financial or real estate firms were removed, as well as companies with incomplete information regarding the firm's banking relationship or other required firm-specific information. This further limited the sample to 281 data points. The resulting interim sample was thereafter investigated for outliers. In line with Dimovski and Brooks (2006), observations with a first-day return more than 3.5 standard deviations from the average were classified as outliers. Thereby eight outliers were revealed within the sample. According to Wooldridge (2003), the inclusion of outliers that are uninformative is not preferable as they increase the standard deviation of the dependent variable and hence, introduces bias in the regression analysis. Because the identified outliers deviate substantially from the mean and cannot be motivated by fundamental firm characteristics, these data points were removed, in accordance with previous research (Dimovski & Brooks, 2006). Consequently, this resulted in a sample of 273 IPOs related to the first hypothesis. Examining the second hypothesis, only firms with a pre-IPO relationship bank that could underwrite the issue were studied. Thus, firms without a banking relationship were excluded together with observations where no information about the bank that served the issuing company before the IPO could be obtained, which ultimately resulted in a dataset of 122 IPOs. Finally, the same 122 observations were considered for

the third hypothesis, where firms that employed the relationship bank as the underwriter were examined and compared to firms that did not.

3.2. Description of Variables (Name used in the data set)

The section below explains the dependent, independent, and control variables used in the comparison of means test and the multiple regression analysis. The control variables have been selected after a review of the existing literature on IPO underpricing, aiming to control for factors that have been found to impact the level of underpricing, in addition to having a pre-IPO banking relationship.

3.2.1. Dependent Variable

Underpricing **(Underpricing)**

Based on the research question and outlined hypotheses, the dependent variable is underpricing. We define underpricing as the percentage change in price between the closing price of the IPO during the first day of trading and the offer price, in line with previous research (Certo et al., 2001; Hao et al., 2014). Henceforth, the dependent variable is specified as follows:

$$Underpricing_i = \frac{P_{Close_i} - P_{Offer_i}}{P_{Offer_i}}$$

Where P_{Close_i} is the closing price on the first day of trading for firm i . P_{Offer_i} is defined as the offer price for firm i. $Underpricing_i$ is defined as the percentage difference between the first-day closing price and the offer price for firm i.

3.2.2. Independent Variables

Banking Relationship **(Lending)**

It has been shown that having a banking relationship before the IPO sends signals to investors that the issuing company is of high value, which lowers the level of underpricing (Slovin & Young, 1990). To test the first hypothesis, a banking relationship dummy variable is utilized. A firm is classified as having a banking relationship if they have a lending agreement with a bank according to the stated information in the balance sheet presented in the IPO prospectus. Banks establish relationships through their monitoring and continuous evaluation of the borrower and are therefore considered as a relationship bank to borrowing firms. This definition follows the methodology used by Schenone (2004) to identify if the firm has a relationship bank. The variable is a binary variable that divides the data into two groups, which takes a value of 1 if the firms are categorized as having a banking relationship before the IPO and 0 otherwise.

***Could Underwrite* (Could)**

Schenone (2004) provide evidence that having a bank-firm relationship with a potential underwriter, i.e., a bank that could, but not necessarily did, underwrite the firm's IPO, lowers the asymmetric information connected to the equity issue. In line with previous research (Schenone, 2004), we define and utilize this variable to test our second hypothesis, which predicts that firms having a banking relationship with a prospective underwriter should experience lower levels of underpricing since information asymmetries between IPO participants are reduced. The variable is a binary variable that takes the value 1 if the banking relationship refers to a bank with underwriting abilities, and 0 otherwise.

Did Underwrite (*Did*)

Puri (1996) and Klein et al. (2016) propose the possibility of conflicting interests when the relationship bank also act as the underwriter of the client firm's equity. The comparative advantage of the relationship bank's access to proprietary information might incentivize pushing lemons to the market to share the default risk of the firm with investors (Klein et al., 2016). Furthermore, Benzoni and Schenone (2009), argue that issues underwritten by a firm's relationship bank could be associated with a conflict of interest compared to IPOs conducted by underwriters without private information before the listing. We define the variable in line with Benzoni and Schenone (2009) to test our third hypothesis, stating that firms that employ their relationship bank as the underwriter experience higher underpricing levels. The variable takes the value 1 if the firm has a pre-IPO relationship with a bank that did take the firm public and 0 otherwise.

3.2.3. Control Variables

***Financial Sponsors* (VCPE)**

VC-firms add value through actively engaging and offering expertise to their portfolio of firms (Dolvin & Kirby, 2016). We include PE-firms in this definition of financial sponsors as well since they tend to engage in companies in a similar manner as VC firms (Kaplan & Strömberg, 2009). This implies a certification effect for investors, resulting in reduced ex-ante uncertainty and thereby, lower underpricing (Barry et al., 1991). Therefore, we expect the firms that are backed by financial sponsors, in the form of VC- or PE-firms, within our sample to experience a lower level of underpricing. Accordingly, we check for such a potential connection by including a binary variable that takes the value 1 if the firm is backed by a PE- or VC-firm and 0 otherwise.

Technology Firms (Tech)

Technology firms often exhibit higher levels of complexity and thereby, higher ex-ante uncertainty for outside investors (Loughran & Ritter, 2004). Accordingly, Dolvin and Kirby (2016) confirm that tech firms experience higher first day returns compared to firms in other industries. Since firms within the technology industry have been shown to exhibit much higher underpricing, we consider this factor by including a tech dummy.

The binary variable takes the value 1 if the company is defined as a tech company and 0 otherwise.

Firm Age at IPO (Log(Age))

Firms that have existed for a longer time are expected to have produced more information that investors can use in their analyses, which should reduce the asymmetric information between the firm and investors and result in a lower level of underpricing (Loughran & Ritter, 2004). Thus, Loughran and Ritter (2004) use the age of the firm as a proxy for firm risk, arguing that older firms are considered less risky. Henceforth, older firms are expected to have lower underpricing within our sample, and therefore, we control for this effect. Firm age is calculated as the difference in years between the firm's founding and the initial public offering. We use the natural logarithm of the defined age plus one, as the effect is expected to be decreasing with the years passing.

Leverage (L/A)

Barry and Mihov (2015) argue that higher leverage is a characteristic of profitable firms, which leads to less ex-ante uncertainty in the valuation and thus lowers the level of underpricing. In line with Chang, Gygax, Oon and Zhang (2008) leverage is included to control for the negative relationship between leverage and underpricing. The variable is defined in line with Chang et al. (2008), where leverage equals total liabilities to total assets presented in the last financial report approved by an accountant before the firm's IPO.

Total Assets (Log(Assets))

It has been shown in previous research that smaller firms, on average, are more underpriced than their counterpart due to the uncertainty connected to the valuation of the company and the sustainability of the business (Ibbotson, Sindelar & Ritter, 1998). The firm size can also be used as a proxy for risk connected to the IPO and the issuing firm, since larger firms can access better tools for survival and profitability, compared to smaller firms (Carter, Dark & Singh, 1998; Finkle, 1998). In line with previous research (Wang, 2005), we use the total asset value of the firm, defined as the total assets presented in the last financial report approved by an accountant prior to the IPO as a proxy for firm size. The natural logarithm of the proxy is used in the regression analysis since the effect is expected to be decreasing with the size of the firm (e.g., Carter et al., 1998; Loughran & Ritter, 2004).

3.3. Methodology

3.3.1. Comparison of Means

To test the outlined hypotheses, the difference in means of the defined subgroups are compared. Conforming to previous research, student's t-tests are performed to be able to compare IPO underpricing between the subgroups to find potential differences (Johnson & Miller, 1998; Aggarwal et al., 2002a). Furthermore, previous research has complemented the t-test with a non-parametric test, namely the Wilcoxon Rank Sum test to allow for different variance between the samples and since it does not require the dependent variable to be normally distributed (Johnson & Miller, 1988; Puri, 1996). Since the dependent variable underpricing is normally distributed[1], there is no need for a non-parametric test, and thus, no Wilcoxon Rank sum test is performed.

3.3.2. Ordinary Least Squares (OLS) Regression Analysis

Previous research investigating the IPO puzzle perform regression analyses to explain the underpricing phenomenon and the various factors affecting the level of money left on the table (Loughran & Ritter, 2004; Cliff & Denis, 2004; Hao et al., 2014). In accordance, potential differences in the subgroups are further examined by performing an ordinary least squares (OLS) regression analysis. This is conducted for the three outlined hypotheses, and hence builds on the relationship between the variable Lending and Underpricing, Could Underwrite and Underpricing, and Did Underwrite and Underpricing. There is little consensus in prior research regarding a definite model that explains IPO underpricing, but it is well-established that multiple factors affect the level of initial first-day returns (Ritter & Welch, 2002; Ljungqvist, 2007). Due to the complexity of the subject and the many potential factors affecting underpricing, it could be the case that variables with the explanatory power of the anomaly are not included in the model. Hence, the regression could be subject to omitted variable bias, which potentially leads to an under- or overestimation of the effect of incorporated variables. Furthermore, the model is defined based on the variables which we have argued for to have an expected impact on underpricing based on the existing literature on the topic, but as mentioned, we acknowledge the potential bias from omitted variables.

The initial regressions are defined as follows:

Equation 1. OLS Regression for Underpricing and Lending:

$$Underpricing_i = \beta_0 + \beta_1(Lending_i) + \beta_2(VCPE_i) + \beta_3(Tech_i) + \beta_3(Log(Age)_i) + \beta_4(L/A_i) + \beta_5(Log(Assets)_i) + \varepsilon_i$$

[1] A Shapiro-Wilk W test for normal data is performed on the dependent variable Underpricing. The test show that it cannot be rejected at a 10 percent level, that the data is normally distributed. The table of the results is presented in Appendix Table A.1.

Equation 2. OLS Regression for Underpricing and Could:

$$Underpricing_i = \beta_0 + \beta_1(Could_i) + \beta_2(VCPE_i) + \beta_3(Tech_i) + \beta_3(Log(Age)_i) + \beta_4(L/A_i) + \beta_5(Log(Assets)_i) + \varepsilon_i$$

Equation 3. OLS Regression for Underpricing and Did:

$$Underpricing_i = \beta_0 + \beta_1(Did_i) + \beta_2(VCPE_i) + \beta_3(Tech_i) + \beta_3(Log(Age)_i) + \beta_4(L/A_i) + \beta_5(Log(Assets)_i) + \varepsilon_i$$

4. Results and Discussion

Below, the results from the empirical analysis are presented, to investigate whether different types of pre-IPO banking relationships affect the level of underpricing for Swedish firms. To start with, descriptive statistics are shown to highlight any particular differences in firm characteristics. After that, the empirical results from the univariate analysis and OLS regressions are presented and finally discussed. Lastly, the limitations regarding the employed data and methodology are discussed.

4.1. Results

4.1.1 Overview of the Data

Before the investigation of the hypotheses, an analysis of the full dataset is conducted to obtain a fundamental understanding of the firm characteristics between the subgroups. In line with Schenone (2004), this is performed since it allows for a more rigorous analysis of the results found in the comparison of means test and OLS regression, and additionally provides an overview of the firm types that are more prone to belong to either group. All of the data and findings referred to in this section is presented in Table 1. This analysis reveals that firms with a relationship bank before the IPO are in general larger firms compared to firms without a relationship bank before the IPO, both considering total assets and the firm valuation at the offering, and also older, looking at the firm age. Furthermore, firms with a banking relationship are more often listed on Nasdaq instead of Spotlight.

When comparing the firms with a relationship bank that could take them public to those that could not, e.g., universal versus non-universal relationship banks, a similar pattern is evident. Firms with a relationship bank that could take them public are in general larger and older firms. It can also be shown that firms with a universal relationship bank are more often listed on Nasdaq than Spotlight, where 87.8 percent of the firms with a universal relationship bank are listed on Nasdaq, compared to 55.0 percent of the firms with a non-universal relationship bank.

Lastly, comparing firms that did go public with their relationship bank as the underwriter to those that did not, it can be concluded that they are also substantially larger and older firms. The firms that employed their relationship bank as the underwriter are

also less often backed by a financial sponsor and to a larger extent tech companies, where 69.4 percent of the firms that employed their relationship bank is VC- or PE-backed and 13.9 percent are classified as tech firms.

Table 1. Descriptive Statistics

The table illustrates descriptive statistics for the sample and subsamples used to examine the stated hypotheses. T-tests are performed for each of the control variables, based on the independent variables *Lending*, *Could Underwrite* and *Did Underwrite* for Group 1, 2 and 3 respectively. *Lending* is a dummy variable that takes on the value 1 if the firm has a pre-IPO lending relationship and 0 otherwise. *Could* is a dummy variable that takes on the value 1 if the firm has a pre-IPO lending relationship with a bank that could underwrite the issue and 0 otherwise. *Did* is a dummy variable that takes on the value 1 if the firm employed their pre-IPO relationship bank as the underwriter and 0 otherwise. *Financial Sponsors* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed before the IPO and 0 otherwise. *Technology Firms* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Firm Age* is defined as the difference in years between the founding and the IPO. *Liabilities to Assets* is the firm leverage, defined as total liabilities to total assets. *Valuation at Offering* is the offer price times the total number of outstanding shares. *Nasdaq* is a dummy variable that takes on the value 1 if the firm is listed on Nasdaq and 0 otherwise. Significance levels (p-values) are specified with asterisks for the difference in means between the subgroups.

Group 1	**Lending**	**No Lending**	
	N = 170	N =103	
Variables	Mean	Mean	Difference in Means
Underpricing	0.073	0.054	0.019
Financial Sponsors (Proportion)	0.512	0.466	0.046
Technology Firms (Proportion)	0.253	0.233	0.020
Firm Age	15.188	8.544	6.645***
Liabilities to Assets	0.557	0.375	0.182***
Total Assets (SEK million)	782.003	64.704	717.299***
Nasdaq (Proportion)	0.729	0.534	0.195***
Valuation at Offering (SEK million)	1 156.442	379.289	777.153***
Group 2	**Could Underwrite**	**Could not Underwrite**	
	N = 82	N =40	
Variables	Mean	Mean	Difference in Means
Underpricing	0.134	0.006	0.128***
Financial Sponsors (Proportion)	0.512	0.650	-0.138*
Technology Firms (Proportion)	0.256	0.275	-0.019
Firm Age	19.28	9,000	10.280***
Liabilities to Assets	0.607	0.529	0.078*
Total Assets (SEK million)	1 556.049	31.555	1 524.494***
Nasdaq (Proportion)	0.878	0.550	0.328***
Valuation at Offering (SEK million)	2 118.999	269.498	1 849.501***
Group 3	**Did Underwrite**	**Did not Underwrite**	
	N = 36	N =86	
Variables	Mean	Mean	Difference in Means
Underpricing	0.129	0.076	0.052
Financial Sponsors (Proportion)	0.694	0.500	0.194**
Technology Firms (Proportion)	0.139	0.314	-0.175**
Firm Age	24.889	12.151	12.738***
Liabilities to Assets	0.674	0.543	0.131***
Total Assets (SEK million)	3 170.023	171.365	2 998.658***
Nasdaq (Proportion)	1.000	0.674	0.326***
Valuation at Offering (SEK million)	3 856.191	531.57	3 324.621***

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

4.1.2. The Effect of a Pre-IPO Banking Relationship on Underpricing

Lending Relationship

To examine whether a bank-firm relationship is associated with a lower level of underpricing, an initial student's t-test is conducted to compare the average first-day return for firms with a pre-IPO banking relationship to firms without one. In line with previous research, suggesting that lending agreements reduce ex-ante information uncertainty as inside debt signals to the market that the IPO firm is of superior quality (e.g., James & Wier, 1990), we expect firms that have such a relationship to be associated with a lower level of underpricing. However, contrary to what is hypothesized, the initial univariate analysis reveals that firms with a preexisting banking relationship on average experience a higher level of underpricing. The difference in means is 1.86 percentage points, however insignificant, presented in Appendix Table A.2. Henceforth, to conduct further examination of the two groups in the sample, a regression analysis is performed to investigate whether a linear relationship can be established between underpricing and the presence of a bank-firm relationship during the IPO.

Several assumptions are expected to be satisfied when running an OLS regression, which is tested to eliminate biases in the presented model. The tests indicate that the regression utilized for the first hypothesis violates the assumption of homoscedasticity in the residuals[2]. Consequently, White's (1980) robust standard errors are employed, which is in line with how previous literature on IPO underpricing handles this issue (Amihud, Hauser & Kirsch, 2003; Rydqvist, 1997).

In line with the results from the comparison of means between the groups, the multiple regression analysis implies no significant relationship between underpricing and the bank-firm lending relationship (see Appendix Table A.3). In contrary to the stated hypothesis, the independent coefficient indicates a slightly positive relationship of 0.2 percentage points when controlling for variables that could be expected to impact the level of underpricing, according to previous research. To conclude, no significant relationship between the presence of a lending relationship and the level of underpricing is found.

Relationship with a Potential Underwriter

The second hypothesis concerns the effect on underpricing when a firm has a pre-IPO relationship with a bank that possesses underwriting abilities. Previous research argues for a negative relation between such a relationship and the first-day return due to reduced information asymmetries between the issuing firm, outside investors, and the underwriter (Schenone, 2004). Contrary to prior findings and to our outlined expectations, the comparison of means shows that firms with close ties to a bank that could also take the

[2] A Variance inflation factors (VIFs) test is performed to test for multicollinearity in line with Corwin (2003). Using a threshold value of 5 in line with Hair et al. (2010), it can be concluded that the results are robust to multicollinearity problems, since the highest identified value is 1.37, presented in Appendix Table A.4. To conclude if the residuals are normally distributed, they are plotted against a normal distribution using a Kernel density estimation. Based on the graph it is not possible to reject that the residuals are normally distributed. The graph is presented in Appendix Graph A.1. Finally, a Breusch-Pagan/Cock-Weisberg test is conducted to test for homoscedasticity in the residuals. The result is presented in Appendix Table A.5, and indicates that it is not possible to reject that the residuals display heteroscedasticity at a 10 percent level.

firm public experience a first-day return of 13.4 percent, while IPOs conducted by firms without such a relationship is severely less underpriced, with an average underpricing level of 0.6 percent (see Table 2). The difference is significant at the 1 percent level. The average underpricing for firms that are served by a non-universal bank deviates substantially from the mean of the sample, and these firms experience close to zero underpricing on average.

Table 2. T-test on Underpricing based on the Independent Variable Could Underwrite
The table illustrates the results of a two-tailed t-test, performed on the dependent variable *Underpricing*. *Underpricing* is defined as the percentage change in price between the first day closing price and the offer price. The test compares the mean, based on the independent variable *Could Underwrite* where the subsample of 122 observations is divided into two subgroups, dependent on if the relationship bank that serves the firm prior to the IPO could underwrite the issue or not.

	N	**Mean**	**Standard Error**	**(95% Confidence Interval)**	
Could Underwrite	82	0.134	0.022	0.090	0.177
Could not Underwrite	40	0.006	0.038	-0.072	0.084
Combined	122	0.092	0.020	0.052	0.131
Difference		0.128	0.041	0.046	0.209

Ha: diff < 0	Ha: diff ! = 0	Ha: diff > 0
Pr(T<t) = 0.999	Pr(| T |>| t |) = 0.002	Pr(T>t) = 0.001

To investigate whether the significant difference found in the t-test is driven by the Could Underwrite variable, a multiple regression analysis is conducted aiming to control for a potential impact from other factors. This is in line with the methodology used in previous research aiming to avoid biases in the regression. No violation of the OLS assumptions is evident when performing tests to control for this[3]. Thus, no modifications were made to the OLS regression for the second hypothesis.

In line with the univariate results, the regression analysis shows a positive slope of the Could Underwrite coefficient. The result presented in Table 3 implies that a pre-IPO banking relationship with a potential underwriter, ceteris paribus, is associated with a higher level of underpricing by 10.6 percentage points, significant at the 5 percent level. Thus, no empirical evidence is found supporting the second hypothesis. Our results contradict the findings of Schenone (2004), that argues for a lower level of underpricing as informational frictions between different IPO participants are reduced. Henceforth, the data specifies an inverse relationship, which is robust when controlling for other known factors affecting the level of underpricing.

[3] The performed VIFs test indicate that the results are robust to multicollinearity, and the highest value is 1.84, which is presented in Appendix Table A.6. When plotting the residuals using a Kernel density estimation with normal distribution it cannot be rejected that the residuals are normally distributed. The graph is presented in Appendix Graph A.2. Lastly, the Breusch-Pagan/ Cock-Weisberg test indicates that there are no problems with heteroskedasticity, and this can be rejected at a 10 percent level. The test is presented in Appendix Table A.7.

Table 3. OLS Regression Results for Underpricing and Could Underwrite

The table illustrates the results from regressions on *Underpricing* for the second hypothesis. The included variables in the regression are *Could*, *VCPE*, *Tech*, *Log(Age)*, *L/A*, and *Log(Assets)*. The table presents the coefficient for each variable and the standard error in parenthesis below the coefficient. *Could* is a binary variable that takes on the value 1 if the firm has a pre-IPO lending relationship with a bank that could underwrite the issue and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed before the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the firm leverage, defined as total liabilities to total assets. *Log(Assets)* is the logarithm of the total assets of the firm. Significance levels (p-values) are specified with asterisks.

Variable	**1**	**2**	**3**	**4**	**5**	**6**
Could	0.128***	0.128***	0.129***	0.113**	0.110**	0.106**
	(0.041)	(0.042)	(0.042)	(0.044)	(0.044)	(0.051)
VCPE		0.004	0.002	0.003	0.002	-0.000
		(0.039)	(0.039)	(0.039)	(0.039)	(0.042)
Tech			0.041	0.040	0.038	0.040
			(0.044)	(0.044)	(0.045)	(0.046)
Log(Age)				0.033	0.033	0.031
				(0.027)	(0.027)	(0.031)
L/A					0.028	0.026
					(0.070)	(0.073)
Log(Assets)						0.004
						(0.026)
Constant	0.006	0.004	-0.007	-0.078	-0.093	-0.091
	(0.034)	(0.042)	(0.044)	(0.074)	(0.082)	(0.084)
R-squared	0.075	0.075	0.081	0.093	0.094	0.094

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

Relationship with the Underwriter

To examine the level of underpricing when the underwriter that manages the IPO possess proprietary information about the issuing firm through prior lending agreements compared to when the underwriter is uninformed, a t-test is conducted. Previous research on the topic is contradictory, where some scholars have found evidence for a conflict of interest effect resulting in more underpriced offerings (e.g., Klein et al., 2016; Kanatas & Qi, 1998). However, the larger part of the research body instead argues in favor of a certification effect that is associated with a lower level of initial returns, as investors are willing to pay a higher price for shares offered by an underwriter with close ties to the IPO firm (e.g., Kroszner & Rajan, 1994; Schenone, 2004). In line with our predictions of a conflict of interest, stated in the third hypothesis, the findings of the univariate analysis indicate that firms that go public with their relationship bank on average experience an underpricing of 12.9 percent. This is 5.2 percentage points higher compared to IPOs underwritten by a bank without a prior relationship with the issuing firm (see Appendix Table A.8.). Although, the difference in means is not significant and thus cannot be confirmed.

To control for the impact of other factors affecting the level of underpricing, we once again conduct a multiple regression analysis controlling for any potential influence from the control variables. Since the OLS regression performed for the third hypothesis presents heteroscedasticity in the residuals, White's (1980) robust standard errors are used[4]. The results from the multiple regression analysis suggest that firms with a previous relationship with a bank that also did act as the underwriter are associated with a slightly lower level of underpricing (see Appendix Table A.9.). The Did Underwrite coefficient in the final regression has the value -0.2 percent. It thus seems as the coefficient could as likely be positive as negative. The initial evidence is more in line with theories arguing for a conflict of interest, but the difference in the level of underpricing is insignificant, and when other variables are included in the regression framework the opposing relation is indicated by the negative coefficient, slightly more in line with a certification effect (Puri, 1996). Hence, we can conclude that the data, although indicative of a positive relation initially and thus in line with theories arguing for a conflict of interest, cannot be determined to specify such a relationship.

4.2. Robustness Tests and Improving the Quantitative Analysis

4.2.1. Robustness Test Methodology

In this section, the robustness, accuracy, and stability of the significant result for the second hypothesis is tested. We employ various tools to contest these findings, to see if other factors affect the outcome. This is achieved through replacing, adding, and removing different regressors, presented as different robustness tests. Employing such robustness tests has been advocated for in previous research since it is considered a valid way of finding misspecification within the model (Leamer & Leonard, 1983; Lu & White, 2014). Thus, we use various tests to conclude if the results in the second hypothesis can be considered to be robust to changes in the model. The tests build on the regression presented in column six for the second hypothesis in the result section. Altogether, five robustness tests are included for this purpose.

Replacing and Excluding Variables due to Low Explanatory Value (first test)

In the first robustness test, two alternations of the model are performed to test how the coefficients are affected. Firstly, Log(Assets) is replaced by another proxy for firm size, defined as the natural logarithm of the offer price times the total number of outstanding shares at the offering, Log(Valuation). The reason for not employing this proxy in the initial model is that the previous literature seldom does. Although, we made a qualitative assessment that young firms might be less likely to have capitalized or presented various assets, especially connected to intangibles, and thus the valuation at the offering might be more representative for the actual size of the firm. Therefore, we expect there to be

[4] A VIFs test show that there are no issues with multicollinearity in the model using a threshold of 5, since the highest identified value is 2.22. The results are presented in Appendix Table A.10. The residuals show no large sign of non-normality when plotting them against a Kernel density estimation with normal distribution. The graph is shown in Appendix Graph A.3. A Breusch-Pagan/Cock-Weisberg test shows that we cannot reject that the residuals have a problem with heteroskedasticity at a 10 percent level (see Appendix Table A.11.).

some differences between the proxies while they still encapsulate the same effect, i.e., that larger firms have a more extensive asset base and a higher valuation at the offering.

Furthermore, in line with Greenland (1989), variables that have very low explanatory value are excluded from the OLS regression. This method relies on subjectively evaluating the influence of control variables when one independent variable, in this case, Could, is used to explain a dependent variable. Thereby, the VC- or PE-backed control dummy is removed from the model. This modification in the model is performed both to refine the model and to see how the coefficients are affected by the change, and the results are presented in Table 4 in robustness test 1.

Including the Stock Exchange (Second test)

In the data sample used for the analysis, the data points are collected from two different types of stock exchanges, Nasdaq and Spotlight. The Spotlight exchange focus on attracting smaller growth companies that aim to evolve and grow their business through a listing, while Nasdaq has different types of lists where companies that go public are often larger and in a later stage of their business growth (Spotlight, 2019). Thus, the firm characteristics should differ depending on what list the company has chosen to go public through. Therefore, a binary variable that takes the value 1 if the company is listed on Nasdaq and 0 if it is listed on Spotlight is included in the regression. It is expected that firms that go public on Nasdaq are larger, older and with a more developed business model and thus, in accordance with the asymmetric information argument, is expected to experience lower levels of underpricing. The variable was not included in the initial model since it was supposed to capture the effect of the age and size of the companies, already included in the existing model. Since it cannot be rejected that the listing place affects the level of underpricing, the Nasdaq dummy variable is included in Table 4 in robustness test 2.

The Cumulative Market Return 15 Days Prior to the Listing (Third test)

The theoretically correct angle of incidence would be to report a market return adjusted underpricing in the regression (Chan, Wang & Wei, 2004; Muscarella & Vetsuypens, 1989). Thus, to account for this factor, a control variable for the market return before the IPO is added to the model. Loughran and Ritter (2004) find that the cumulative return the previous 15 trading days before the IPO is a well-fitting proxy for predicting IPO underpricing. Thus, we control for significant market events around the IPO by including a control variable in line with Dolvin and Kirby (2016). The variable is defined as the cumulative return for the index OMXS30 the previous 15 trading days before the IPO. The chosen index is fitted to the current market environment in Sweden overall, to encapsulate any significant market events around the IPO date. A market return variable was not included in the initial OLS regression since the effect and difference is often negligible due to the low daily returns compared to the first day returns of IPOs (Beatty & Ritter, 1986). The low daily returns are considered by including the cumulative return for 15 days, which should be more extensive than the one day-return and thus capture important market events around the IPO. Since it is not impossible to reject the impact

of the market return on the underpricing within the sample, it is considered through a robustness test (see Table 4 robustness test 3).

Including Industry Fixed Effects (Fourth test)

It has been shown that different industries historically experience different levels of underpricing (Loughran & Ritter, 2004). While the lion's share of the IPO underpricing literature contemplates this factor affecting the underpricing, by including a binary variable for tech firms (e.g., Loughran & Ritter, 2004; Cliff & Denis, 2004), some authors include industry fixed effects (e.g., Schenone, 2004). Previously we assessed that the tech dummy would sufficiently capture this effect, but as a robustness test, and since we cannot conclude if the variable de facto captures the industry effects, we remove this variable and instead include industry fixed effects. The industry classifications identified using GICS were later narrowed down to seven classifications of broader industry groups: Technology, Healthcare, Manufacturing and Industrial, Consumer, School, Energy and Professional Services. Companies that lacked a natural industry were clustered together with the most similar classification, for instance, Mining and Aerospace were included in Manufacturing and Industrial. In total, six dummy variables are added to consider the effects of the defined industries. The results are presented in Table 4 in robustness test 4.

Including Time Fixed Effects (Fifth test)

The level of underpricing has differed a lot between years, and periods such as the internet bubble during 1999 to 2000 has to a large extent impacted the first day returns for firms going public (Loughran & Ritter, 2004). A substantial part of the existing research has incorporated this effect in their analyses, and while some has employed time fixed effects (Schenone, 2004), others have included a dummy variable for a particular period such as the dot-com bubble (Loughran & Ritter, 2004; Dolvin & Kirby, 2016). In line with Schenone (2004), this well-known source affecting the underpricing levels is tested for, by employing binary variables for each year except for one. Dummy variables for the year 2015, 2016, 2017, and 2018 are thus added to the analysis. Time fixed effects were not included in the initial model, since the chosen period for the sample has been characterized as a hot IPO market throughout all of the five years, with no significant market events comparable to the dot-com bubble (EY, 2018). Consequently, no substantial differences are expected between the years, but since this cannot be concluded, time fixed effects are added as a robustness test (see Table 4, robustness test 5).

4.2.2. Results of the Robustness Tests

In the first three robustness tests, no significant changes are evident to the overall model and the related coefficients. The fourth and fifth test, introducing industry and time fixed effects, respectively, seem to have a more considerable impact on the regression. The impact on the model is specifically evident considering time fixed effects, which affects multiple coefficients and the explanatory value of the model. This induces that there is a

large difference in the level of underpricing depending on the year in which the IPO takes place. The Could variable's significant effect on the level of underpricing persists throughout the five performed robustness tests, although the significance level decreases to the 10 percent level when industry and time fixed effects are simultaneously included. The coefficient for Could is 10 percent at lowest, and 12.8 percent as highest when no other regressors are incorporated. The results thus indicate that the significant result of the Could coefficient is robust. Furthermore, since the t-tests and all performed regressions present a significant result, the Could variable seem to capture a significant effect on underpricing, despite the substantial differences in firm characteristics between the two subgroups. In line with the presented results, we argue that this section provides evidence that the previous finding for the second hypothesis is robust, implicating that a pre-IPO relationship with a universal bank leads to a higher level of underpricing within the studied sample.

Table 4. OLS Regression Robustness Tests for Hypothesis Two

The table illustrates the results from regressions on *Underpricing* for the robustness tests of the second hypothesis. The included variables in this regression are *Could, VCPE, Tech, Log(Age), L/A, Log(Valuation), Nasdaq, Market Return*. We also include *Industry Fixed Effects*, and *Time Fixed Effects*. This table presents the coefficient for each variable and the standard error in parenthesis below the coefficient. *Could* is a dummy variable that takes on the value 1 if the firm has a pre-IPO lending relationship with a bank that could underwrite the issue and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed before the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the firm leverage, defined as total liabilities to total assets. *Log(Valuation)* is the logarithm of the offer price of the company times the number of outstanding shares. *Nasdaq* is a dummy variable that takes on the value 1 if the firm is listed on Nasdaq and 0 otherwise. *Market Return* is the cumulative return of the OMX30 Index 15 days before the IPO. *Industry Fixed Effects* incorporates 6 dummy variables for all industries except for one; the different dummy variables take on the value 1 if the firm is classified as belonging to that industry and 0 otherwise. *Time Fixed Effects* incorporates 4 dummy variables, one for each year except for 2014, the dummy variables take on the value 1 if the firm IPO takes place in the specific year and 0 otherwise. Significance levels (p-values) are specified with asterisks.

Variable	**1**	**2**	**3**	**4**	**5**
Could	0.113**	0.113**	0.111**	0.121**	0.100*
	(0.048)	(0.048)	(0.048)	(0.051)	(0.052)
Tech	0.036	0.036	0.032		
	(0.046)	(0.046)	(0.047)		
Log(Age)	0.035	0.035	0.035	0.034	0.036
	(0.029)	(0.029)	(0.029)	(0.030)	(0.030)
L/A	0.031	0.032	0.035	0.048	0.048
	(0.072)	(0.072)	(0.072)	(0.074)	(0.073)
Log(Valuation)	-0.003	-0.004	-0.004	-0.004	-0.005
	(0.014)	(0.017)	(0.017)	(0.017)	(0.017)
Nasdaq		0.008	0.005	0.012	0.034
		(0.060)	(0.060)	(0.061)	(0.063)
Market Return			0.505	0.512	0.385
			(0.613)	(0.640)	(0.642)
Industry Fixed Effects	No	No	No	Yes	Yes
Time Fixed Effects	No	No	No	No	Yes
Constant	-0.085	-0.084	-0.082	-0.070	-0.073
	(0.089)	(0.089)	(0.090)	(0.023)	(0.241)
R-squared	0.094	0.094	0.100	0.115	0.168

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

4.3. Discussion of the Results

4.3.1. The Effect of a Pre-IPO Lending Relationship

Concerning the first hypothesis, predicting that the presence of a lending relationship prior to the IPO signals that the firm is of high quality to investors, no results in favor of the theory presented by Beatty and Ritter (1986), are found. Thus, it is indicated that having a relationship bank before the IPO does not seem to provide a signaling effect for investors within the studied sample. Since no significant findings are established, we would argue that it could be the case that the stated theory oversimplifies the signaling effect a banking relationship is expected to have (Slovin & Young, 1990). Depending on the type of bank that serves the firm before the IPO, i.e., if the bank is universal or not, there are different types of signaling effects for investors to use when deciding to subscribe to the IPO (Benston, 1990; Puri, 1996). Universal banks offer products across scopes that non-universal banks cannot, and through the informational economies of scope, this might imply that they attain an informational advantage compared to non-universal banks (Neuhann & Saidi, 2018; Schenone, 2004). We would argue that this informational advantage can be interpreted differently from an investor perspective, either as a certifier of a correct company valuation or as a conflict of interest inherent to the business model of universal banks that investors want to be compensated for.

4.3.2. The Effect of a Pre-IPO Relationship with a Universal Bank

Regarding the second hypothesis, stating that firms with a relationship bank that could underwrite the IPO should experience a lower level of underpricing, a significant difference has been detected where firms that have a previous banking relationship with the ability to underwrite the IPO experience a significantly higher level of underpricing. This result contradicts the findings in previous research (Schenone, 2004). There seems to be no support for the theory that having a universal relationship bank reduces information asymmetries between the IPO participants within the studied sample. Thus, no empirical results were found in support of the second hypothesis. Therefore, the signaling theory (Slovin & Young, 1990), perhaps do not oversimplify the signaling effect of banking relationships, but instead, the investors within our sample might not use such signals to determine the quality of a company. This is indicated since neither the first nor the second hypothesis supports that relationship banks, with or without underwriting abilities mitigate informational frictions between IPO stakeholders. The theories connected to relationship banking and IPO underpricing cannot explain these findings, but as mentioned throughout the thesis, the theories are rather unexplored. Hence, we would suggest that the fundamental characteristics of the firms and its wider implications could serve as an alternative explanation. Furthermore, it can be argued that previous research might have assigned too much explanatory power to the impact of having a relationship bank as a mitigator of informational disparities between stakeholders during an IPO, which might not be the general case in all market contexts.

In our sample, firm characteristics seem to be associated with the type of bank a company has a relationship with before the IPO, where older and larger firms in general borrow from universal banks[5]. Besides, it is evident that companies served by non-universal relationship banks, in general, are of smaller size. Because institutional investors can have certain requirements or legal restrictions regarding which stock exchanges they are allowed to invest in, and regarding the type of companies they have in their portfolio (Hellman, 2000), they might be prone to mainly invest in larger IPO companies listed on a more developed stock exchange, e.g., Nasdaq, which to a large extent corresponds to firms that have a universal relationship bank, in our sample[6]. In addition, previous research argues that institutional investors are recurring investors in IPOs and that they tend to receive larger allocations of shares in underpriced issues than retail investors do (Loughran & Ritter, 2002; Aggarwal et al., 2002b). Therefore, firms with universal relationship banks could be more exposed to large institutional investors that push down the valuation, which partially explains why they experience a significantly higher level of underpricing. Albeit, since both size proxies and a stock exchange dummy are included in the regressions, and are unable to explain the underpricing since the Could Underwrite variable is significant also when they are included, these control variables are not able to explain the difference in the level of underpricing. Instead, we argue that the overall characteristics of the firms that are served by a universal relationship bank within our sample potentially correlate with institutional investments in the IPO. As institutional ownership is not controlled for in the regression, it could be an omitted factor that would be able to explain the reason for the significant difference in the level of underpricing observed.

Furthermore, considering that firms with non-universal relationship banks, in general, are smaller and younger, they could have had fewer funding rounds and thus retained a more concentrated ownership structure. Owning a more substantial stake of the firm increases the owner's incentives to get a fair valuation and not lose money from a too generous offer price, while a more fragmented ownership structure might find it value maximizing to allow some underpricing due to the costs inherent with monitoring the underwriter (Baron, 1982). Also, smaller firms might have to sell a more significant part of their company to make it worthwhile going public, compared to larger firms. Thus, the ownership structure is perhaps affected to a more considerable extent for firms with a non-universal relationship bank, and it gets too expensive for the pre-IPO owners to allow a large underpricing to signal high quality, in line with Allen and Faulhaber (1989). Due to the same reasons that firms served by a universal relationship bank might be more attractive targets for institutional investors, i.e., the firm size, listing place, firm age, and potential ownership structure, they could to a larger extent be covered by equity analysts and have more long-term investors they want to satisfy. In line with this, we suggest that firms with a universal relationship bank might be more prone to allow underpricing, since these firms could be more dependent on analyst coverage and that the

[5] The difference in the average assets and firm age is significantly smaller at a 1 percent level for firms with a non-universal bank (see Table 1).
[6] Firms with a universal relationship bank are significantly more often listed on the Nasdaq exchange at a 1 percent level (see Table 1).

investors have a positive first impression of the company, e.g., the benefits Welch (1989) and Cliff and Denis (2004) claims are received for allowing an underpricing of the IPO. These factors regarding the firm characteristics and ownership structure could potentially correlate with being served by a universal relationship bank and explain part of the results found for the second hypothesis. We thus argue that firms with universal relationship banks might be more inclined to leave money on the table while firms with non-universal banks see fewer benefits in underpricing their issue.

Departing from the focus on asymmetric information, we suggest that being a firm with a universal banking relationship could be associated with some underlying factors which have not been included in our regression analysis but are important for the level of underpricing when going public. These factors relate mainly to who are allocated shares in the issue and the pre-IPO owners' willingness to leave money on the table. It is therefore argued that the banking relationship per se perhaps do not drive the substantial difference in underpricing between the subgroups, although it captures a significant effect that might be due to the abovementioned omitted factors.

4.3.3. The Effect of a Pre-IPO Relationship with the Underwriting Bank

The third hypothesis aims to investigate if investors require a risk premium for the potential inherent conflict of interest when firm-specific information obtained from a lending agreement is combined with underwriting activities (e.g., Benzoni & Schenone, 2009). Initially, an insignificant difference indicative of a potential conflict of interest is found when performing a comparison of means test. When controlling for other factors in the OLS regression analysis, the coefficient instead indicates a negative slope, although insignificant. Our results imply that investors do not need to be compensated for the risk of a potential conflict of interest (Klein et al., 2016) nor do they rely on banks as certifiers of superior firm quality (Puri, 1996). We suggest that the findings could potentially be interpreted as if the Swedish IPO market is rather transparent with already low informational asymmetries between IPO stakeholders within the studied time frame, which is supported by the fact that the Swedish IPO market on average has a lower level of underpricing than most other countries do in the more recent years (Abrahamson & de Ridder, 2015; Loughran, Ritter & Rydqvist, 2018). Therefore, investors may be indifferent to whether the relationship bank underwrites the IPO or not.

4.4. Limitations

There are several limitations and potential areas of improvement connected to the quantitative methodology. Firstly, regarding the sample, the chosen data span over a short period. During the studied period, e.g., 2014 to 2018, Sweden has experienced a boom in the number of IPOs conducted (EY, 2018). Investigating a more extended time frame and not only a hot IPO market might have generated a more comprehensive examination to understand the underpricing anomaly better.

It should also be noted that there might be a potential endogeneity problem with the statistical model. Possibly, the type of relationship bank that serves the company is

not random, but instead, other factors correlate with both underpricing and the firm's pre-IPO banking relationship. For instance, it could be the case that a third factor, such as the ownership concentration correlates with both a specific type of relationship bank and the level of underpricing, as discussed in section 4.3.2. The issue connected to potential endogeneity problems is considered by including multiple factors that potentially correlate with both underpricing and the type of relationship bank the firm is served by, in the analysis by running an OLS regression. In addition, the issue is considered by discussing and acknowledging alternative explanations of the findings that were not included in the model but potentially would provide some explanatory power if the factor could be incorporated.

Another restriction is the number of data points. The ability to draw general conclusions is difficult given the small data set and the limitation to the Swedish market. The Nordic countries should be expected to present a similar banking climate, and by expanding the sample to all of these countries, a more extensive data set would be attained. Thus, by increasing the time frame and the number of included countries, a more extensive result and conclusion could potentially be drawn.

Furthermore, outliers are removed to allow for a more rigorous analysis. This is because significant results could be found for some variables otherwise based on a single extreme outlier[7]. In line with previous research, observations that deviate 3.5 standard deviations from the mean are removed (Dimovski & Brooks, 2006). The employed methodology to identify and remove outliers is a less arbitrary way than winsorizing the dependent variable at a certain level since it is adjusted to the specific observations within the data set and thus outliers are only identified if there are any substantial deviations within the sample. Previous research on IPO underpricing differ in handling this dilemma, and mainly papers with small samples seem to adjust for outliers in the primary analysis, which is in line with this thesis. Banerjee, Dai and Shrestha (2010) winsorizes their dependent variable to mitigate the effect from outliers, and Chambers and Dimson (2009) use the same methodology as a robustness test, while Dimovski and Brooks (2006) use a predetermined threshold based on the standard deviation to remove outliers from their primary analysis. Thus, there seems to be no consensus on how to handle the impact of outliers on the sample in IPO underpricing research, but rather a qualitative assessment to the specific case seems necessary. As evidenced in the footnote, performing an analysis including the outliers decreases the ability to draw reasonable conclusions due to the massive impact of such observations. Therefore, we handled this, with what we considered the best alternative, based on existing research of IPO underpricing. Henceforth, the weakness in the presented methodology is mainly due to the lacking consensus amongst scholars on how to handle the stated dilemma.

Moreover, some of the utilized variables are not defined in line with the most prominent research of the topic due to the lack of access to adequate data, which might impact the reliability of the proxies. For instance, considering the VC and PE dummy, it

[7] It should be noted that by including all data points, there is no significant results for the second hypothesis. By removing the largest outlier, which refers to a company with a first-day return of 310.7 percent, the findings for the second hypothesis is significant when performing an OLS regression controlling for other factors. This exemplifies the need of an adjustment for outliers. Otherwise, a single data point can induce a certain result.

would have been interesting to include the size of the ownership stake, since owning a larger share of the company would create a stronger incentive to bargain with the underwriter to attain a higher valuation. Furthermore, tech companies in the sample are defined rather wide, and by having access to similar company classifications as previous research, e.g., SIC-codes, to be able to single out high-tech companies, might have provided a better proxy for the industry effects. This is handled to some extent by considering industry fixed effects as a robustness test. Furthermore, the strength of the banking relationship might be necessary to signal high quality to investors. Potentially, the mere existence of a banking relationship is not interpreted as a strong enough signal of firm quality, and thus do not impact the level of underpricing. This could be a potential explanation for the lack of findings connected to the reduction of asymmetric information due to banking relationships, in the sample. In line with previous research, this thesis limits the definition of banking relationships to whether the firm has a banking relationship or not (Schenone, 2004). Thus, the variables do not include the size or number of existent financial services. Hence it would be value adding to investigate if the extent of the relationship has an impact on the signaling effect of pre-IPO banking relationships.

Lastly, having a proxy for the ownership concentration and whether institutional investors invest in the IPO, would allow for a more rigorous analysis of the findings. Since these omitted factors are discussed as potential explanations of the findings in the second hypothesis, including them, would result in a more comprehensive analysis.

5. Implications and Conclusion

In this section, the economic implications of the findings are presented. After that, we suggest topics for future research to investigate based on the results, and the overall understandings that have been established regarding the IPO puzzle. Lastly, the conclusion of the thesis is presented.

5.1. Economic Implications

The presented results in section 4.2. shows that, ceteris paribus, firms with a pre-IPO universal relationship bank experience a level of underpricing that is 10 percentage points higher compared to firms with a non-universal relationship bank. To grasp the economic implication of this finding, the average cost in terms of lost IPO proceeds translates to SEK 81.94 million[8]. Thus, the money left on the table showcases the significant loss the pre-IPO owners experience due to the higher level of underpricing. Although multiple factors affect the underpricing level, it can be concluded that having a relationship bank that could underwrite the firm's IPO has a substantial effect on the amount foregone by the issuing firm within the investigated sample.

[8] The average IPO proceeds for the firms having a pre-IPO relationship with a bank that could underwrite the issue, i.e., a universal relationship bank, are SEK 819.43 million (see Appendix Table A.12). The cost in terms of lost proceeds is the total amount equivalent to 10 percent of the underpricing, which amounts to SEK 81.94 million.

5.2. Suggestions for Future Research

The presented results contradict previous research by Schenone (2004) who investigates IPOs in the US during 1998 to the end of 2000, and since this thesis use more recent IPO data in another geographical market, it would be interesting to see if the same result would be found in the US using a corresponding time frame. Besides, further investigating the geographical differences between the US and Sweden to conclude if the findings in this thesis depend on a specific market climate for banks, would enhance the understanding of banking relationship's effect on IPO firms.

Moreover, it would be interesting to see if there is a difference in long-term performance depending on the pre-IPO banking relationship. Since it is heavily argued that informational frictions are the primary source of underpricing, and by going public the asymmetric information should be reduced and the true value of the company should revert to a mean (Miller, 1977). Hence, it would be interesting to investigate if there is a difference in the performance of these firms in the long run, which would enable a more robust conclusion regarding how the business scope of pre-IPO banking relationships affects the firms' IPO performance.

Furthermore, as evidenced in the result section, our data and analysis reinforce the difficulties with utilizing a linear model to get a useful prediction model of the underpricing anomaly. This is probably because multiple variables are influential, and thus a linear relationship cannot easily be described. Future research could employ artificial intelligence (AI), in the form of machine and deep learning to get a better prediction model, in line with Tao, Deokar and Deshmukh (2018) that introduces a way of utilizing such technology for analyzing IPO prospectuses. A methodology using AI might allow better explanatory power of this complex phenomena, but the existing research in the field considering AI is still in its early stage. Since intrigued scholars have failed in establishing a conventional model for the underpricing anomaly for decades, this new practice could be a way of getting closer to a final solution of the IPO underpricing puzzle.

5.3. Conclusion

This thesis aimed to investigate how pre-IPO banking relationships affect the level of underpricing for Swedish firms. Given the prior mixed empirical evidence, three hypotheses were defined to disentangle the effect relationship banks have on the underpricing levels, using a data set of IPOs conducted between 2014 and 2018 on the Swedish equity market. Firstly, firms with a lending relationship before their IPO show no difference in the level of underpricing compared to firms without a lending relationship. The evidence does not support a signaling effect from having a lending relationship before going public, and investors do not seem to interpret such a relationship as a signal of high quality on average. Secondly, firms with a universal relationship bank are compared to firms with a non-universal relationship bank. The empirical analysis shows a significant difference in the level of underpricing, where firms

served by a relationship bank with underwriting abilities are subject to a 10 percentage points higher underpricing on average. The presented result is robust to other factors affecting the level of underpricing, in the form of firm characteristics, IPO characteristics, and market circumstances. Lastly, no significant difference in the level of underpricing is evident when comparing firms that employ their relationship bank as the underwriter to those that did not. Thus, the findings in the second hypothesis cannot be explained by a potential conflict of interest, when the information obtained through screening and monitoring are combined with underwriting abilities during the IPO. The empirical evidence does not indicate that there is a certifying effect on the issue either since firms that employ their relationship bank as the underwriter do not seem to experience a lower level of underpricing.

Relationship banking's effect on the level of underpricing within the studied sample seems to be contingent on the business scope of the relationship bank, rather than if the relationship bank de facto has a lending relationship with the firm or underwrites the issue. Henceforth, based on the overall findings, relationship banking, across different business scopes, does not seem to mitigate informational frictions between the issuing firm, the underwriter, and investors. Instead, the empirical results indicate that firms within the investigated sample that have a pre-IPO universal relationship bank leave a substantial amount of money on the table when going public.

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Appendix

Tables

Table A.1. Shapiro-Wilk W Test for Normal Data for Underpricing
This table illustrates the results of a Shapiro-Wilk W Test for Normal Data for the dependent variable *Underpricing*. *Underpricing* is defined as the percentage change in price between the first day closing price and the offer price. The test tests the null hypothesis that the variable is normally distributed.

Variable	N	W	V	z	Prob>z
Underpricing	273	0.988	2.363	2.009	0.022

Table A.2. T-test on Underpricing based on the Independent Variable Lending
The table illustrates the results of a two-tailed t-test, performed on the dependent variable *Underpricing. Underpricing* is defined as the percentage change in price between the first day closing price and the offer price. The test compares the mean based on the independent variable *Lending*, which divides the sample into two subgroups dependent on if the firm have a lending agreement with a bank according to the information stated in the IPO prospectus and the last reported balance sheet prior to the IPO or not.

	N	**Mean**	**Standard Error**	**(95% Confidence Interval)**	
Lending Relationship	170	0.073	0.032	0.033	0.112
No Lending Relationship	103	0.054	0.020	-0.009	0.117
Combined	273	0.066	0.017	0.031	0.100
Difference		0.019	0.036	-0.089	0.052

Ha: diff < 0	Ha: diff ! = 0	Ha: diff > 0
Pr(T<t) = 0.698	Pr(| T |>| t |) = 0.603	Pr(T>t) = 0.302

Table A.3. OLS Regression Results for Underpricing and Lending

The table illustrates the results from regressions on *Underpricing* for the first hypothesis. The included variables in the regression are *Lending*, *VCPE*, *Tech*, *Log(Age*), *L/A* and *Log(Assets*). The table presents the coefficient for each variable and the robust standard error in parenthesis below the coefficient. *Lending* is a dummy variable that takes on the value 1 if the firm has a pre-IPO lending relationship with a bank and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed before the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the firm leverage, defined as total liabilities to total assets. *Log(Assets)* is the logarithm of the total assets of the firm. Significance levels (p-values) are specified with asterisks.

Variable	**1**	**2**	**3**	**4**	**5**	**6**
Lending	0.019	0.019	0.018	0.013	0.014	0.002
	(0.038)	(0.037)	(0.038)	(0.040)	(0.042)	(0.042)
VCPE		-0.060	-0.006	-0.070	-0.006	-0.017
		(0.034)	(0.034)	(0.035)	(0.035)	(0.036)
Tech			0.039	0.038	0.038	0.045
			(0.042)	(0.042)	(0.042)	(0.043)
Log(Age)				0.010	0.010	-0.006
				(0.024)	(0.024)	(0.027)
L/A					-0.005	-0.009
					(0.052)	(0.051)
Log(Assets)						0.032*
						(0.018)
Constant	0.054*	0.057	0.048	0.030	0.031	0.029
	(0.032)	(0.038)	(0.039)	(0.062)	(0.065)	(0.064)
R-squared	0.001	0.001	0.005	0.005	0.005	0.013

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

Table A.4. VIFs Test - Lending

This table presents the variance inflation factors (VIFs), for the independent and control variables used in the regressions. In this table the VIF for each variable used to investigate the first hypothesis is presented. *Lending* is a dummy variable that takes on the value 1 if the firm has a pre-IPO lending relationship with a bank and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed before the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the leverage of the firm, defined as total liabilities to total assets. *Log(Assets)* is the logarithm of the total assets of the firm.

Variable	VIF	1/VIF
Lending	1.22	0.82
VCPE	1.05	0.95
Tech	1.03	0.97
Log(Age)	1.36	0.73
Leverage	1.11	0.90
Log(Assets)	1.48	0.67
Mean VIF	1.21	

Table A.5. Breusch-Pagan/Cook-Weisberg Test for Heteroscedasticity for Lending

The table illustrates the results from a Breusch-Pagan test performed to test if the regression is subject to problems with homoscedasticity. In this table the test is presented for the regression with the independent variable *Lending*. The regression includes the control variables *VCPE*, *Tech*, *Log(Age)*, *L/A* and *Log(Assets)*. *Lending* is a dummy variable that takes on the value 1 if the firm has a pre-IPO lending relationship with a bank and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed prior to the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the firm leverage, defined as total liabilities to total assets. *Log(Assets)* is the logarithm of the total assets of the firm. The test tests the null hypothesis that the residuals are homoscedastic.

Variables: Fitted Values of Underpricing

Chi2(1)	Prob > chi2
6.380	0.012

Table A.6. VIFs Test - Could Underwrite

This table presents the variance inflation factors (VIFs), for the independent and control variables used in the regressions. In this table the VIF for each variable used to investigate the second hypothesis is presented. *Could* is a dummy variable that takes on the value 1 if the firm has a pre-IPO lending relationship with a bank that could underwrite the firm's issue and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed before the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the leverage of the firm, defined as total liabilities to total assets. *Log(Assets)* is the logarithm of the total assets of the firm.

Variable	VIF	1/VIF
Could	1.49	0.67
VCPE	1.14	0.88
Tech	1.10	0.91
Log(Age)	1.40	0.72
Leverage	1.11	0.90
Log(Assets)	2.04	0.49
Mean VIF	1.38	

Table A.7. Breusch-Pagan/Cook-Weisberg Test for Heteroscedasticity for Could

The table illustrates the results from a Breusch-Pagan test performed to test if the regression is subject to problems with homoscedasticity. In this table the test is presented for the regression with the independent variable *Could Underwrite*. The regression includes the control variables *VCPE*, *Tech*, *Log(Age)*, *L/A* and *Log(Assets)*. *Could* is a dummy variable that takes on the value 1 if the firm has a pre-IPO lending relationship with a bank that could underwrite the firm's issue and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed prior to the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the firm leverage, defined as total liabilities to total assets. *Log(Assets)* is the logarithm of the total assets of the firm. The test tests the null hypothesis that the residuals are homoscedastic.

Null Hypothesis: Constant Variance

Variables: Fitted Values of Underpricing

Chi2(1)	Prob > chi2
2.150	0.143

Table A.8. T-test on Underpricing based on the Independent Variable Did Underwrite

The table illustrates the results of a two-tailed t-test, performed on the dependent variable *Underpricing*. *Underpricing* is defined as the percentage change in price between the first day closing price and the offer price. The test compares the mean, based on the independent variable *Did Underwrite* and the subsample of 122 observations is divided into two subgroups, dependent on if the relationship bank that served the firm prior to the IPO did underwrite the issue or not.

	N	**Mean**	**Standard Error**	**(95% Confidence Interval)**	
Did Underwrite	36	0.129	0.024	0.079	0.178
Did not Underwrite	86	0.076	0.026	0.024	0.129
Combined	122	0.092	0.020	0.052	0,128
Difference		0.052	0.044	-0.034	0.014

Ha: diff < 0	Ha: diff ! = 0	Ha: diff > 0
Pr(T<t) = 0.883	Pr(| T |>| t |) = 0.235	Pr(T>t) = 0.117

Table A.9. OLS Regression Results for Underpricing and Did Underwrite

The table illustrates the results from regressions on *Underpricing* for the third hypothesis. The included variables in the regression are *Did*, *VCPE*, *Tech*, *Log(Age)*, *L/A* and *Log(Assets)*. The table presents the coefficient for each variable and the robust standard error in parenthesis below the coefficient. *Did* is a dummy variable that takes on the value 1 if the firm employed their pre-IPO relationship bank as the underwriter and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed before the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the firm leverage, defined as total liabilities to total assets. *Log(Assets)* is the logarithm of the total assets of the firm. Significance levels (p-values) are specified with asterisks.

Variable	**1**	**2**	**3**	**4**	**5**	**6**
Did	0.052	0.056	0.066*	0.040	0.033	-0.002
	(0.036)	(0.036)	(0.035)	(0.035)	(0.036)	(0.045)
VCPE		-0.021	-0.025	-0.017	-0.016	-0.023
		(0.040)	(0.040)	(0.039)	(0.039)	(0.040)
Tech			0.051	0.046	0.041	0.049
			(0.054)	(0.054)	(0.058)	(0.058)
Log(Age)				0.046*	0.048*	0.033
				(0.027)	(0.027)	(0.031)
L/A					0.042	0.027
					(0.072)	(0.073)
Log(Assets)						0.031
						(0.024)
Constant	0.076***	0.087***	0.073**	-0.040	-0.064	-0.066
	(0.026)	(0.032)	(0.034)	(0.076)	(0.089)	(0.089)
R-squared	0.012	0.014	0.024	0.047	0.049	0.059

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

Table A.10. VIFs Test - Did Underwrite

This table presents the variance inflation factors (VIFs), for the independent and control variables used in the regressions. In this table the VIF for each variable used to investigate the third hypothesis is presented. *Did* is a dummy variable that takes on the value 1 if the firm employed their pre-IPO relationship bank as their underwriter and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed before the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the leverage of the firm, defined as total liabilities to total assets. *Log(Assets)* is the logarithm of the total assets of the firm.

Variable	VIF	1/VIF
Did	1.81	0.55
VCPE	1.08	0.93
Tech	1.11	0.90
Log(Age)	1.40	0.72
Leverage	1.12	0.89
Log(Assets)	2.22	0.45
Mean VIF	1.46	

Table A.11. Breusch-Pagan/Cook-Weisberg Test for Heteroscedasticity for Did

The table illustrates the results from a Breusch-Pagan test performed to test if the regression is subject to problems with homoscedasticity. In this table the test is presented for the regression with the independent variable *Did Underwrite*. The regression includes the control variables *VCPE*, *Tech*, *Log(Age)*, *L/A* and *Log(Assets)*. *Did* is a dummy variable that takes on the value 1 if the firm employed their pre-IPO relationship bank as the underwriter and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed prior to the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the firm leverage, defined as total liabilities to total assets. *Log(Assets)* is the logarithm of the total assets of the firm. The test tests the null hypothesis that the residuals are homoscedastic.

Null Hypothesis: Constant Variance

Variables: Fitted Values of Underpricing

Chi2(1)	Prob > chi2
3.280	0.070

Table A.12. Mean Proceeds

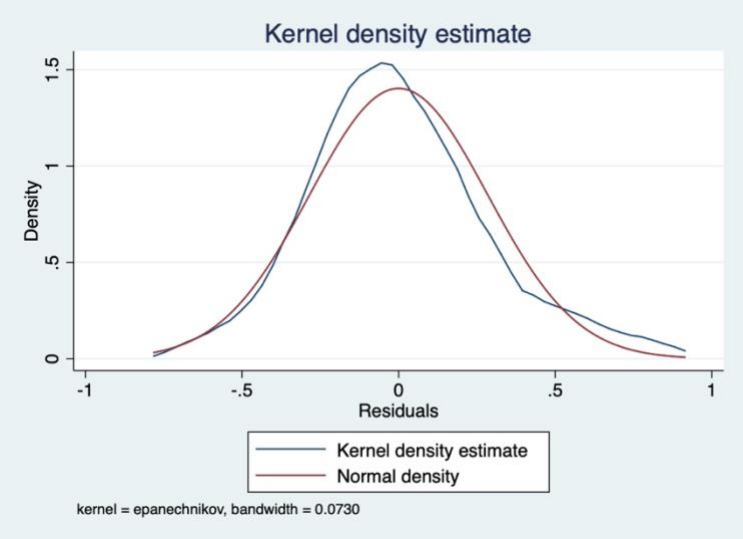
This table presents the mean proceeds for firms with a universal relationship bank in the sample, e.g. Could = 1 firms. Could is a dummy variable that takes on the value 1 if the firm has a pre-IPO lending relationship with a bank that could underwrite the firm's issue and 0 otherwise. *Proceeds* is defined as the number of shares offered times the subscription price, given that the offer is fully subscribed. This information was not possible to find for two firms in the sample. Thus, the total number of firms included in the calculation is 80 firms. (Numbers presented in SEK million).

Variable	Mean	Standard Deviation
Proceeds	819.434	146.707

Graphs

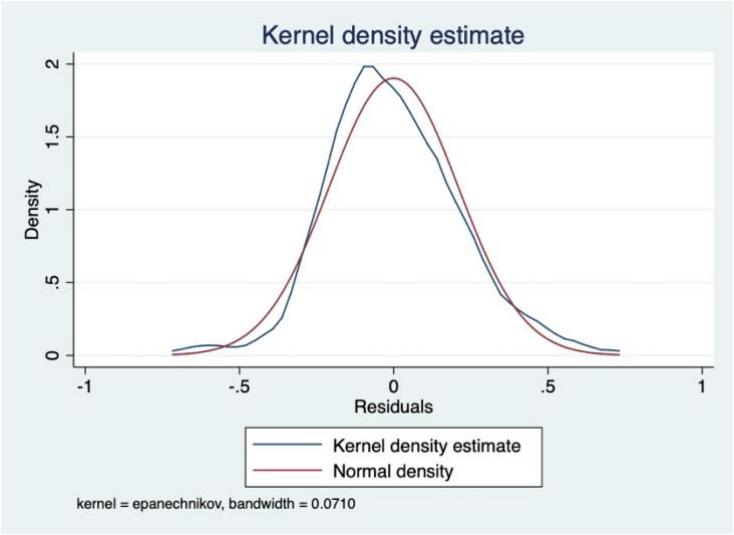
Graph A.1. Plotted Residuals for the OLS Regression for Underpricing and Lending

The graph illustrates the plotted residuals from the regression on *Underpricing* for the first hypothesis. The included variables in the regression are *Lending*, *VCPE*, *Tech*, *Log(Age*), *L/A* and *Log(Assets*). *Lending* is a dummy variable that takes on the value 1 if the firm has a pre-IPO lending relationship with a bank and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed before the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the firm leverage, defined as total liabilities to total assets. *Log(Assets)* is the logarithm of the total assets of the firm.



Graph A.2. Plotted Residuals for the OLS Regression for Underpricing and Could

The graph illustrates the plotted residuals from the regression on *Underpricing* for the second hypothesis. The included variables in the regression are *Could*, *VCPE*, *Tech*, *Log(Age*), *L/A* and *Log(Assets*). *Could* is a dummy variable that takes on the value 1 if the firm has a pre-IPO lending relationship with a bank that could underwrite the firm's issue and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed before the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the firm leverage, defined as total liabilities to total assets. *Log(Assets)* is the logarithm of the total assets of the firm.



Graph A.3. Plotted Residuals for the OLS Regression for Underpricing and Did

The graph illustrates the plotted residuals from the regression on *Underpricing* for the third hypothesis. The included variables in the regression are *Did*, *VCPE*, *Tech*, *Log(Age*), *L/A* and *Log(Assets*). *Did* is a dummy variable that takes on the value 1 if the firm employed their pre-IPO relationship bank as the underwriter and 0 otherwise. *VCPE* is a dummy variable that takes on the value 1 if the firm is VC- or PE-backed before the IPO and 0 otherwise. *Tech* is a dummy variable that takes on the value 1 if the firm is classified as a tech firm and 0 otherwise. *Log(Age)* is the logarithm of the firm age at the IPO plus one. *L/A* is the firm leverage, defined as total liabilities to total assets. *Log(Assets)* is the logarithm of the total assets of the firm.