IPO Underpricing Following Private Placements: An analysis on the effect of equity and debt private placements on underpricing during subsequent IPOs

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Abstract

The purpose of this thesis is to investigate the relationship between having conducted a private placement of equity or debt, prior to going public, and the subsequent IPO underpricing. We compare a sample of 107 IPOs with prior private placements of equity and 95 IPOs with prior private placements of debt to two control groups, matched by industry, issue year and issue size. The study is limited to US IPOs during the time-period 1992-2014. Our findings indicate that firms that have carried out successful private placements of either equity or debt may face a lower degree of underpricing during their subsequent IPOs. In addition, the mitigating effect on underpricing seems to be more pronounced the shorter the time between the private placement and the IPO. We suggest that private placements may constitute a signal of quality as well as improved monitoring, which could reduce the level of ex ante uncertainty and thus also the underpricing. Furthermore, the results indicate that private placements show tendencies of reducing underwriter fees during the IPO, arguably as a result of improved monitoring, lessening the required level of the lead bank's monitoring efforts.

Keywords: Private placements, underpricing, initial public offerings, information asymmetry, exante uncertainty, certification, monitoring

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1. Introduction

Underpricing of initial public offerings (IPOs) is a worldwide and persistent phenomenon, which has been an area of much research throughout the years. While the magnitude of underpricing has fluctuated depending on the time-period (averaging 21% in the 1960s, 12% in the 1970s, 16% in the 1980s, 21% in the 1990s and 40% from 2000-2004 in the US, Ljungqvist 2007), the main issue remains – that a large amount of money is left on the table.

To this day, there are several theories explaining the underpricing phenomenon – rational as well as behavioural. Within the rational field there are theories stretching from various ownership and control aspects to institutional explanations. While underpricing is likely to be a function of many interactive forces explained by different models, theories regarding information frictions between different agents have received particularly strong recognition in the academic literature. Under Rock's winner's curse information model (1986), firms may be required to permit underpricing in order to ensure the participation of uninformed investors in the IPO market (Ljungqvist 2007). In addition, Beatty and Ritter's (1986) show that a higher degree of ex ante uncertainty regarding the firm value increases the expected underpricing. These two theories are often applied in conjunction, implying that underpricing arises as an equilibrium condition to induce the participation of investors in the IPO market, and its level is required to increase in proportion to the level of uncertainty.

Though some research suggest that underpricing might entail positive signalling effects improving the probability of successful seasoned offerings (Welsh 1989), the phenonomon often constitute a substantial cost to the original shareholders and it should lie in their interest to reduce this cost. There is research indicating that capital-raisings prior to IPOs can have an effect on both the implicit and explicit cost of going public. James and Wier (1990) show that firms with bank relationships prior to the IPO experience less underpricing, which is supported by Schenone (2004) and Habib and Ljungqvist (2001). Cai, Lee and Sarma (2011) find similar results when investigating equity private placements. The common conclusion amidst these papers is the certifying role the relationships create ameliorates the effect of information asymmetry in regard to the quality of the issuing firm thus lowering the cost of forthcoming funds.

This thesis focuses on the external funding alternative of private placements (hereafter denoted as PPs); both in the form of equity (hereafter denoted as PPE) and debt (hereafter denoted as PPD), and its effect on underpricing during their subsequent IPOs. For unlisted companies this financing tool is a step to be introduced into the investment community and

build an investor base. In spite of the absence of disclosure requirements for these offerings, they tend to increase the public awareness of the firms in question. Moreover, it is possible that PPs may reduce the uncertainty regarding the firm value. Firstly, a successful PP implies that a number of investors perceive the firm to be an appropriate investment, which arguably can be viewed as an endorsement of the firm. In addition, it may signal the possession of insider information. Consequently, it can be hypothesized that PPs could facilitate as a certification signalling tool, mitigating the effect of information asymmetry and associated risk for investors. Secondly, as PPs are commonly directed to a small number of investors they are also associated with stronger monitoring, which also tend to reduce uncertainty. In conclusion, PPs might lessen the level of uncertainty regarding the firm value and thus the underpricing, assuming that Beatty and Ritter's theory holds.

Previous research on equity and debt PPs is limited and the main focus has been on already listed firms, in particular on the announcement effects of these (Fields and Mais 1991, Hertzel and Smith 1993). Moreover, the various capital raising alternatives have, as far as we can see, always been analyzed in isolation. Firms that choose to undertake a PPD or PPE prior to their initial public offering seem to encompass similar characteristics. Thus the purpose of this thesis is to determine whether there is one mechanism which proves to be more effective than other depending on various features of the issuing firm or the time-frame in question**.** The aim is to unravel the relationship between undertaking a PP prior to an IPO and both the implicit and explicit costs; underpricing and underwriter spread. The results could have implications on how firms rationalize between alternatives of pre-IPO capital raisings in order to reduce the potential costs of going public.

This study examines IPO underpricing of a sample of 107 PPE IPO firms (defined as firms that have undertaken at least one successful private placement of equity prior their IPO) and 95 PPD IPO firms (firms that have undertaken at least one successful private placement of debt prior their IPO) in comparison to firms that have not carried out such capital raisings, during the period of 1992 – 2014. It is established that both PPs in the form of equity and debt lead to significantly less underpricing during the subsequent IPO, even after controlling for various explanatory factors that have been acknowledged to affect underpricing.

The remainder of this thesis is structured as follows. The next section outlines capital raising alternatives prior to IPOs and more specifically the detailed features of PPEs and PPDs. Section 3 includes the relevant literature and previous research within the field of pre-IPO financing and the effect on underpricing. This transitions into our research hypothesis regarding

the effect of PPs prior to IPOs as well as our underlying thoughts on why one can expect a difference between the subsamples. Section 4 provides a description of the data collection process and variable definitions followed by an explanation of the chosen methodology. Section 5 presents a discussion around the results and compares them to existing literature. Section 6 adds some robustness tests. Conclusions and recognized limitations are drawn in Section 7 and 8 respectively.

2 Private Placements

Private placements (PPs) are methods of raising capital by selling securities to a relatively small number of selected investors in the form of stocks or bonds. These investors are predominately large banks, mutual funds, insurance companies and pension funds; usually classified as "accredited investors" in the US. PPs differ from public issues, which are underwritten, as they are typically negotiated directly with the single/group of investors without oversight from the Securities and Exchange Commission (SEC) (Hertzel, Lemmon, Linck, Rees 2002). This is a result of PPs being exempted from the registration requirements under the Securites Act of 1933, which stipulates that any offer or sale of securities using means and instrumentalities of interstate commerce should be registered with the SEC. For non-listed firms, PPs allow privately held firms to be released into the investment community. Despite the fact that no prospectus is made public in the process, the announcement of PPs are often published in various business journals increasing public awareness of issuing firm. In general, firms that decide to exercise a PP are typically of smaller size seeking to fund growth and expansion and can be an advantageous prelude to going public (Carey, Prowse, Rea and Udell 1993).

There are several advantages of PPs compared to public offerings. First of all, PPs do not require brokers or underwriters and are thus less expensive and time-consuming. As PPs are exempted from the registration requirements of Securities Act of 1933, it is also possible to release confidential proprietary information to a selected limited number of investors rather than the general public. In addition, PPs enable firms to handpick appropriate investors in regard to vision about the firm but also prior expertise. Since the issue often is directed towards more proficient investors the deal can be structured in a more complex and customized way.

2.1 Equity Offering

In an equity offering, the company sells partial ownership in the company through the sale of stock or membership unit. Early-stage companies tend to favour this alternative, as there exists no set repayment schedule or debt service payments.

2.2 Debt Offering

In a debt offering, the company raises debt financing through the selling of a note instrument to investors comprised of a set annual rate of return and maturity date. The maturity date highlights when the funds are required to be paid back to the respective investors. PPDs have similar characteristics as a bank loans but differ as the creditor/lender is in this case a set of one or several investors rather than a bank.

2.2.1 Private versus Public Debt

Larger firms as well as firms with greater average issue sizes tend to exploit economies in issuance costs of public debt and consequently have a higher share of public debt. Moreover, due to high flotation costs, small firms or firms with smaller issues will consider the public debt market cost ineffective. According to the contracting costs hypothesis, if private lenders are better informed than public lenders, then younger firms and firms with greater potential information asymmetries will issue more private debt (Krishnaswami, Spindt, Subramaniam 1999). Monitoring tends to be more effective in PPDs compared to public debt, which often leads to free-rider problems or duplication of efforts due to the large number of investors. Furthermore, the quality of the monitoring is further strengthened as PPD investors mainly consists of institutions with both expertise as well as economies of scale in credit monitoring.

3 Literature Review and Hypothesises

This section includes a summary of relevant theories related to information asymmetry explaining underpricing, followed by previous literature on the research that has been conducted on capital raisings prior to IPOs and their possible implications on information asymmetry and agency problems. Based on relevant theories we develop hypotheses under the two main categories; 1) certification and quality signalling and 2) monitoring.

3.1 Theories explaining Underpricing

3.1.1 Adverse Selection and the Winner's Curse

Rock's winner's curse model (1986) assumes that there are two different investor groups – informed and uninformed (commonly analogous for institutional and retail investors). The informed investors have access to superior information regarding the true firm value and will therefore only subscribe to an IPO if the expected after-market price is higher than the offering price. Uninformed investors on the other hand lack superior information and will subscribe to IPOs indiscriminately. When an offering is underpriced the demand is high and shares will be rationed proportionally to the excess demand. This has the implication that uninformed investors will be allocated a disproportionately large amount of overpriced shares, a phenomenon referred to as the 'Winner's Curse'. If uninformed investors are not compensated so that they at least break even they will eventually leave the IPO market. Since informed investors are too few to satisfy the whole IPO market, the participation of uninformed investors are required to meet the capital demand. Thus, issuers, who are assumed to be unaware of the true firm value as well as risk averse, will provide a discount in form of underpricing in order to ensure full subscription of the IPO. This underlying theory is widely acknowledged and supported by research by See Koh and Walter (1989), Keloharju (1993), Amihud, Hauser, and Kirsh (2003).

3.1.2 Level of Ex Ante Uncertainty

A hypothesis that has also received much empirical support is that developed by Beatty and Ritter in 1986 suggesting that a higher degree of ex ante uncertainty regarding the firm value increases the expected underpricing (James and Wier 1990). The intuition behind this hypothesis can be explained by the following analogy. The decision to participate in information production before an IPO can be compared to the decision to invest in a call option on the IPO. The option will be exercised if the "real" price exceeds the strike price, that is, the offer price. In the same way as an ordinary stock option the value of this option will increase proportionally to the valuation uncertainty. Hence, the higher degree of uncertainty, the more investors will be informed. Furthermore, the higher number of informed investors will exacerbate the winner's curse problem, which will increase the required underpricing.

To summarize the preceding two theories, underpricing arises as an equilibrium condition to induce the participation of investors in the IPO market, and its level is required to increase in proportion to the level of uncertainty.

3.2 Theories on how uncertainty regarding firm value can be reduced

3.2.1 Certification/Quality Explanation

Issuing a pre-IPO PP involves an intensive process of persuading and communicating the firm quality to a concentrated group of investors. Moreover, as literature regarding information asymmetry postulates that certain investors have more access to proprietary information compared to others (Wruck and Wu 2009), a successful PP should signal a high quality level and prospects of the issuing firm, since an informed investor has agreed to invest in the company. In line with the information hypothesis – PP discounts reflects costs incurred by the investors to access the firm value and thereby become informed (Wruck, 1989, Hertzel, Smith 1993). Hence, a PP could be perceived as a quality signal and therefore cause less underpricing during the IPO. The credibility of a signal usually increases with the costs of the decision. One could contend that the illiquidity associated with PPEs in the form of for example lock-up periods, should increase the cost of a bad decision as the asset cannot easily be divested.

Additionally, highly levered firms commonly face tougher budget restrictions and may possess less control over the firm's cash flow. This potentially leads to increasing transparency and diminishes the severity of agency conflicts between managers and outside investors. Thus, in the case of PPDs, borrowing from intermediaries may signal a firm's creditworthiness and can lessen information costs for all of a firm's claimants (Campbell and Kracaw 1990 and Fama 1985). Furthermore, recent research has highlighted that quality firms withholding a larger amount of information asymmetry seem to choose PPs over public offering when raising external capital in order to reduce the costs of adverse selection and information production (Maksimovic and Pichler 2006). The fact that PPs is a tool to circumvent costs associated with adverse selection, the PP should serve as a quality signal, which may aid in reducing uncertainty of the quality of the issuing firm. If one assumes that PP has the same effect on information asymmetry in both the cases of private and public firms, this leads us to our main hypothesis in line with the information asymmetry argument:

H_{1A}: *Both private placements of debt and equity reduce the level of ex ante uncertainty of the issuing firm, decreasing the subsequent IPO underpricing*

Transitioning from the reasoning above, we hypothesize that PPs are more valuable for younger firms. It can be contended that available information is more limited for younger, increasing the level of uncertainty regarding their true value. In line with this reasoning they should require stronger persuasion towards investors; leading the signalling effect to have a stronger impact.

H_{1B}: *In line with the ex ante uncertainty hypothesis and the certification hypothesis, the strength of the quality signal is stronger for younger firms. Hence, underpricing is reduced to a greater extent by prior private placements for younger firms*

Furthermore, it can be assumed that the level of ex ante uncertainty should be stronger for firms within High-Tech industries. Applying the same reasoning as in the previous hypothesis, we form the following hypothesis:

H_{1C}*: In line with the ex ante uncertainty hypothesis and the certification hypothesis, PPs have a stronger effect in reducing underpricing for High-Tech firms*

Moreover, in line with the quality-signalling hypothesis, it can be argued that PPs within a close proximity (time-frame) of the IPO, reflects a more accurate "up-to-date" picture of the issuing firm. Hence the following hypothesis can be derived:

H_{1D}: *The shorter the period between the private placement and the IPO, the greater the reduction of underpricing.*

3.2.2 Monitoring

In theory, larger shareholders and increased ownership concentration should reduce the free rider problem associated with firm monitoring. Research suggests that ownership concentration may have a significant impact on the firm value due to improved corporate governance (Demsetz and Lehn 1985 and Shleifer and Vishny 1986). This is often referred to the monitoring hypothesis. In addition to monitoring, a larger blockholder also has a stronger incentive to contribute with expert advice and could potentially improve the efficient use of corporate

resources. The illiquidity of PPs could further reinforce the incentive to monitor the firm, as argued by Jenney and Folta (2006).

It has been suggested that the benefits of monitoring is dependent on firm size (Liang and Jang 2013, Morck, Shleifer, Vishny 1988 and Hertzel and Smith 1993). Smaller firms tend to be growing, more illiquid and with a higher degree of managerial ownership. For these firms corporate governance and conflicts of interest are generally not the main concerns of investors. The main uncertainty is regarding the future growth prospects of the company, thus the information the certification signalling effects should be stronger than the monitoring effect. In contrast, firms that are larger tend to be more liquid but with a more dispersed ownership. Thus, the relative importance of monitoring is higher.

In line with the monitoring theory one can assume that venture capital firms (VCs) can be considered active investors with improved monitoring, and thus the following hypothesis can be constructed:

H_{2A}: *IPOs that are venture capital backed experience less underpricing during their IPOs*

Arguably underwriters have two methods of pricing the issuing firm's risk; explicitly through the underwriting spread and implicitly through underpricing. Hansen and Torregrosa (1992) argue that underwriter spread is influenced by the percentage of managerial ownership of the issuing firm. Thus higher levels of managerial ownership lessen the lead bank's monitoring efforts, consequently lowering the underwriter spread. This argument could similarly be applied to the existence of PPs as they consequentially increase monitoring due to the existence of concentrated investors. If this is the case, PPs prior to IPOs could potentially both reduce the implicit costs as well as explicit costs; underpricing and underwriter spread.

H_{2B}: *Firms that have exercised a successful private placement prior to their IPO face a relative lower cost in the form of underwriter fees during their IPO*

3.2.3 Pecking Order Theory

While there in practice are various company specific factors influencing a firm's choice of financing type, the pecking order theory suggests that, in general, debt is to be preferred to equity. The theory is based on the assumption that the management knows more about the firm's risks and future prospects than external investors, incentivizing them to issue equity when they consider it to be overvalued. Investors will anticipate this demand a lower price for the equity (Myers and Majluf 1984). Based on this theory it can be hypothesized that for firms with similar

characteristics, a PPD should act as stronger quality signalling tool than a PPE, reducing the underpricing more.

H_3: *In accordance with the pecking order of capital structure a PPD IPO should experience less underpricing compared to its PPE counterparts*

3.3 An Opposing Interpretation of Underpricing

It should be noted that the following theory exists in regard to reasons for underpricing in general. Firms may deliberately agree to sell their shares at a lower price than the market signals they are valued at, having the effect of discouraging lower quality issuer from imitating. Subsequently, these firms are able to recover their loss through future issuing activity (Welsh 1989), attain positive market response through dividend announcements (Allen and Faulhaber 1989) or by increased analyst coverage. If this hypothesis holds, then underpricing may not necessarily in all cases be considered a negative issue, and could have positive effects on the company forthcoming.

4 Data Collection and Methodology

In this study, the sample is constructed using IPOs reported in the Thomson Financial Security Data Corporations' (SDC Platinum) New Issues Database. The time frame analyzed is 1992 – 2014, with the aim of catching time-period fluctuations in underpricing, however having a starting date post the regulatory changes in 1992 to remove the potential bias effect. Prior to 1992, the SEC placed harsher restrictions regarding the "number" and "type" participating. Furthermore an additional alteration was the allowance of a broader promotion effort by the company. Due to the alleviations, the quality of the "signalling" may be perceived different prior to 1992 and lies beyond this research.

Furthermore, listings on other exchanges than NYSE and NASDAQ have been excluded as well as issues with share prices less than 5 dollars. In order to remove potential effects due to regulatory differences, stock issues by financial and utility firms (Standard Industrial Classification (SIC) codes 6000–6999 and 4900–4999) have been excluded. Moreover, in regard to PPDs, Rule 144A PPs are excluded from the sample as they are tradable between institutions in the secondary market and therefore to a large degree resemble public debt. In addition, debt with floating rates has been excluded to reduce the risk of classification errors. Arguably, a commitment to a fixed rate in comparison to a floating rate yields stronger

incentive for the creditors to investigate the borrower prior to lending. We manually fill in gaps in SDC's coverage of company founding dates, and total assets using SEC filings found in the Edgar database. After these selection steps, the final sample includes 111 PPE IPO firms, 98 PPD IPO.[1]

4.1 Descriptive Statistics

We construct two separate treatment groups. Treatment 1 refers to firms carrying out an IPO with a previously successful PPE. Treatment 2 refers to firms carrying out an IPO with a previously successful PPD. We compare these two treatments respectively to a third group, which are firms with no previous successful PP activity of this sort. Two-sided t-statistics are carried out on each firm characteristic to determine whether there is a difference in means between the two treatment groups compared to all other IPOs.

4.2 Matching – *Univariate analysis, firm characteristics and first-day returns*

The raw comparison between the different groups of IPOs assumes that the provision of a PPE and PPD is randomly distributed across firms. In this scenario, the causal effect is merely the difference between the average underpricing of the comparison groups. However, both capital raising alternatives represent endogenous choices of the issuing firms. This introduces the issue of selectivity bias both in the provision of PPE and PPD as well as in the characteristics of IPO firms who have obtained one of the capital raising alternatives. To address this issue we use the method of propensity score matching. A matched sample of IPOs is generated where each PPE and PPD IPO is matched to an IPO from the comparison sample on the following variables: within the same year, industry (based on the first number of the SIC code) and of similar issue size. It should be noted that Total Assets was not added as a matching criteria due to lack of observations. However, as Total Assets is proven to be highly correlated with the variable Issue Size,[2] this does not prove to affect our matching procedure. The nearest neighbour technique is implemented resulting in four observations in the PPE sample and three in the PPD sample not obtaining relevant matches, thus reducing our sample to 107 and 95 observations respectively. The difference in means is carried out using two-sided t-statistics for equal variances for the

[1] Note: After completing our matching procedure the sample is reduced to 107 PPE firms and 95 PPD firms
[2] The correlation between *Ln_Assets* and *Ln_Issue Size* amounts to 0.79 highlighted in the correlation matrix displayed in Table 8 in the appendix

various firm characteristics.[3] This implies a null hypothesis that the characteristics for prior PP firms are equal in comparison to non-PP firms during their IPOs.

Moreover, the difference in underpricing is examined for the sample PPE and PPD firms and compared to the respective matched sample across 1) time period, 2) industry (High-Tech versus Non High-Tech).

4.3 Ordinary Least Squares (OLS) Regression A

In order to test our hypotheses, the following regressions are carried out:

A regression analysis to investigate known factors of the underpricing phenomenon with our two treatment samples (PPE and PPD IPOs) and our matched sample (control group). The dependent variable is underpricing, defined as the percentage change between the offer price and first-day closing price. The percentage change between the final offer price and the first day closing price are both attained from SDC. Our independent variables control firm and issue sizes, industry as well as for business cycle fluctuations.

PPE/PPD dummies are computed as binary variables equalling one if the issuer completed a successfully private placement of equity or debt respectively prior their IPO and zero otherwise. These dummy variables capture the difference in underpricing between issuing firms that had prior PPs and those that did not in a multivariate regression setting.

Ln_Issue Size is the natural logarithm of the IPO issue size (in dollar million) excluding the potential overallotment. Chemmanus and Paeglis (2005) conclude that the larger the issue sizes of IPOs, the greater the certification of managerial quality of the issuing firm. Their argument stems from the hypothesis that larger issue sizes reflect a greater scale of value creating investment projects.

VC is a dichotomous variable equal to one if the firm was backed by a venture capital fund and zero otherwise.

High_Tech is a dichotomous variable equalling one if the firm is considered in the "high-technology sector" as identified following the classification methods in Loughran and Ritter (2004).[4] Firms within these sectors can be considered more difficult to analyse due to the immaterial nature of their assets and their sensitivity to future development that are difficult to

[3] Equal variances has been tested through Levene's test generating high p-values which concludes that the variances cannot be considered significantly different

[4] The SIC codes included are as follows: 3571, 3572, 3575, 3575, 3577, 3578, 3661, 3663, 3669, 3674, 3812, 3823, 3825, 3826, 3827, 3829, 3841, 3845, 4812, 4813, 4899, 7370, 7371, 7373, 7374, 7375, 7378, 7379

foresee, such as difficulties in anticipating technology changes and estimating growth opportunities (Barron, Byard, Kile and Riedl 2002). Consequently, one could contend that High-Tech firms are associated with higher level of uncertainty. Thus, the coefficient of this variable is assumed to be positive.

Ln_Age is a variable indicating the age of the firm, calculated as the number of years between the year of formation and the year of the relative IPO. This variable is commonly used as a proxy for informational asymmetry (Ljungqvist 2007). Despite the fact that the firm has not been public prior to the IPO, one can expect the market to have more information on the firm the older it is, thus hypothesize that age is negatively correlated with information asymmetry, (documented by Muscarella and Vestuypens 1989).

Time Between is a continuous variable calculated as the time period between the previous PP and the subsequent IPO.

Ln_Assets is the natural logarithm of the dollar value of the total assets of the firm prior to the IPO (in dollar million). A method of measuring a firm's size is by quantifying the total assets. The larger the firm, one could expect more available information hence reducing uncertainty, and thus, this variable can be used as a proxy for *ex ante* uncertainty.

Issue_Year dummies are included in order to control for potential cyclical fluctuations. With this addition, we are able to determine whether the observed impact is constant over time. After observing the documented increase in underpricing in the years 1999 and 2000, a dummy variable is created, denoted as *IT Bubble*, corresponding to issues for these years to control for the effect.

Conclusively, the regression model created looks as follows:

$$Underpricing\ (\%) = a + \beta_1(PPE) + \beta_2(PPD) + \beta_3(Ln\ Issue\ Size) + \beta_4(IT\ Bubble) + \beta_5(VC) + \beta_6(High\ Tech) + \beta_7(Ln\ Age) + \beta_8(Time\ Between) + \beta_9(Ln\ Assets)$$

Additionally, in order to test our sub-hypotheses, we add various interaction variables to our main regression. The interactive variables are calculated as the product of the PP dummies with the appropriate explanatory variable relating to the sub-hypothesis. These being the following: the *High-Tech* dummy (*int_HT_PPE/PPD*) and the continuous variables age as well as time between the PP and the IPO[5]. Lastly we investigate whether the explicit cost of going public,

[5] Observations for which this variable is calculated to be zero are eliminated as private placements at the time of the IPO is not within the scope within this investigation.

that of underwriter spread (defined as the underwriter fee as a percentage of the issue size excluding potential overallotment), is affected by having carried out a previous PP. An OLS regression is carried out in the same manner as in the first case, but using the *Underwriter Spread* as the dependent variable and the *PPE/PPD dummies* as proxies for monitoring. The regression looks as follows:

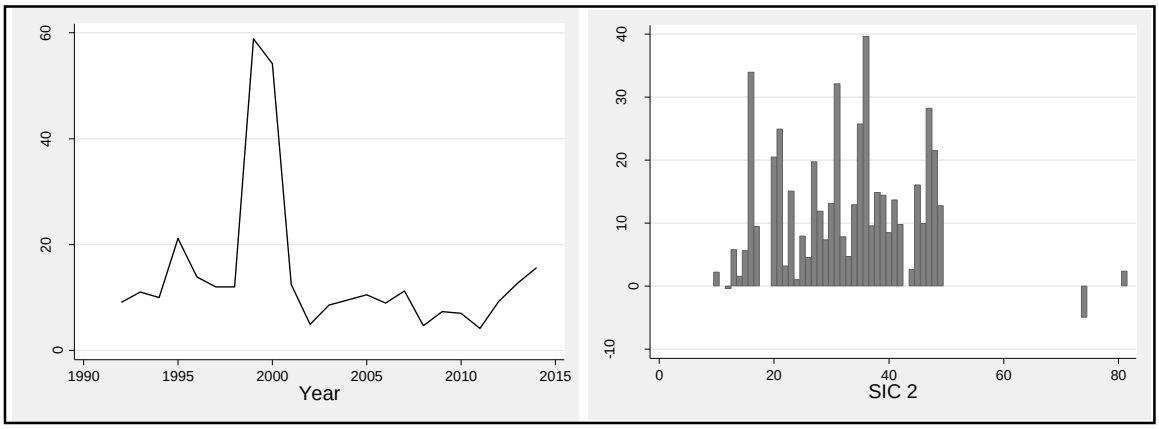
$$Underwriter\ Spread\ (\%) = a + \beta_1(PPE) + \beta_2(PPD) + \beta_3(Ln\ Issue\ Size) + \beta_4(VC) + \beta_5(Ln\ Age) + \beta_6(Ln\ Assets)$$

5 Empirical Results

In the following section the empirical results are outlined and analyzed in the light of existing literature as well as the developed hypotheses. Section 5.1 discusses the comparison in regards to various characteristics across our three samples where Section 5.2 discusses the differences between our two treated samples and matched sample and tests whether the hypothesis holds across various subsamples. Section 5.3 analyzes the explanatory effects on underpricing through an OLS regression, testing our main hypothesis that previous PPs reduce underpricing, whereas Section 5.4 focuses on our sub-hypothesis. Section 5.4.2 focuses on the explicit costs of going public through OLS regressions on our two treatment samples and matched samples.

Table 1 shows a breakdown of IPOs and their issue sizes by year intervals in our three sub-samples and Figure 1 shows average underpricing over time for our whole sample. As indicated in the results and in line with previous findings, there is a pronounced cyclicality in extent of underpricing and volume during the sample period. Judging by our sample, it seems equally popular to complete a PPE prior to an IPO and a PPD however it should be noted that the completion of a PP of both sorts proves to be rather rare, with 7% of our sample completing a PPE and 6% completing a PPD. In accordance with previous research by Ritter and Welch (2004), underpricing also seems to change over time. Further, we partition our sample using the first two numbers of the SIC code and conclude that underpricing indeed varies depending on the industry in focus, as suggested by Ritter and presented in Figure 2. These effects are taken into account when performing matching in our subsequent regression.

Figure 1 – Underpricing over time **Figure 2 – Underpricing per industry**



Note: Figure 1 shows the average underpricing of our complete sample from the period 1992 to 2014. Figure 2 shows the average underpricing for firms active in different industries, as categorized by the Standard Industrial Classification (SIC) code.

As shown in Table 1, the average size of the IPOs varies with the mean ranging between 38.25 and 196.94 for PPE IPOs, 59.86 and 348.80 for PPD IPOs and 31.57 and 245.17 for all other IPOs during the sample period. There is a distinct increase in the average IPO issue size for all three samples during the period 1999-2000 which is partly explained by the dot-com bubble, with a large amount of companies being taken public due to the "hot" market conditions. Loughran and Ritter (2004) document these results and partially explain the pattern due to the relaxation of standards by reputable underwriters, causing an increasing amount of unprofitable companies being taken public during the time period.

Table 1. Distribution of PPE and PPD average issue sizes over time compared to our comparison sample

	PPE IPOs		PPD IPOs		Comparison sample of all other IPOs	
	Number	Average Issue Size	Number	Average Issue Size	Number	Average Issue Size
1992-1998	53	38.25	81	59.86	1153	31.57
1999-2000	10	179.49	5	348.8	163	95.88
2001-2007	22	196.94	7	141.33	426	168.43
2008-2014	26	53.76	5	201.00	392	245.17
Total	111	86.06	98	87.61	2134	119.19

Note: Table 1 presents the number of PPE and PPD IPOs and the average issue sizes (in million dollars) across various sub-periods in compared to our comparison sample. The average issue size of the IPOs is defined as the average issue size of the offer excluding the potential overallotment offer.

5.1 Comparison of the Three Samples

In Table 2 we examine the difference in firm characteristics as well as the implicit and explicit costs of IPOs (underpricing and underwriter spread) for our three samples; PPE IPOs, PPD IPOs and all other IPOs. The issue size cannot be concluded to be significantly different whereas the average age for both PPE IPOs and PPD IPOs is significantly larger, averaging 11 years for PPE IPOs and 15 years for PPD IPOs whereas all other IPOs have an average of 9 years. Total assets before the offering is not significantly different for the PPE IPO sample, yet significantly larger for the PPD IPO sample at 1% level. A higher proportion of PPE IPOs seem to be backed by VC firms whereas the High-Tech proportion seems fairly similar across all groups. Lastly, one can note the lower underwriter spread for both the PPE and PPD IPOs at 5.1% and 4.4% respectively compared to 6.1%. This result is in line with our hypothesis that the presence of a previous private placement not only decreases the implicit cost of underpricing, but also the explicit costs of the underwriter spread. This hypothesis is tested further in Table 5 in OLS regression B.

When comparing the PPE and PPD sample in Table 2, Panel C, similar levels of underpricing are shown as well as issue sizes and underwriter spread. The PPD sample is significantly older (with an average age of 18 years compared to 11 years for PPEs) and with a higher amount of assets on their balance sheet. Moreover, as expected, a significantly larger proportion of PPEs are VC backed. Worth noting is also the significantly longer time period between (~3 years) the PPs and the IPOs in the PPD sample.

Table 2. Offer and Firm Characteristics of PPE and PPD sample vs Comparison sample

Panel A	PPE IPO sample			Comparison sample of all other IPOs			Differnce in means, t-statstic
Variables	N	Mean	Median	N	Mean	Median	
Underpricing	111	4.76	1.71	2399	14.43	5.50	3.1546***
Issue Size	111	84.78	40.5	2532	86.31	38.5	0.1083
Age	105	10.70	9.00	1530	8.01	6.00	-3.6606***
Total assets before the offering	97	79.13	29.30	1920	95.59	28.80	0.9399
VC proportion	111	0.59	-	2532	0.45	-	-3.0854***
High-Tech proportion	111	0.35	-	2532	0.31	-	-0.8290
NASDAQ proportion	111	0.82	-	2532	0.72	-	-2.4417**
Underwriter Spread	76	5.05	3.90	1835	6.16	5.00	1.7519*
Panel B	PPD IPO sample			Comparison sample of all other IPOs			Differnce in means, t-statstic
	N	Mean	Median	N	Mean	Median	
Underpricing	95	8.22	1.67	2025	15.10	6.25	2.1244**
Issue Size	98	87.62	44.38	2134	103.04	41.33	0.3897
Age	89	15.35	9.00	1278	8.50	7.00	-6.3423***
Total assets before the offering	67	178.74	86.00	1618	100.90	31.50	-3.5899***
VC proportion	98	0.36	-	2134	0.43	-	1.3843
High-Tech proportion	98	0.21	-	2134	0.32	-	0.5366
NASDAQ proportion	98	0.69	-	2134	0.72	-	2.2850**
Underwriter Spread	93	4.43	3.93	1531	6.09	4.94	2.9027***
Panel C	PPE IPO sample			PPD IPO sample			Differnce in means, t-statstic
	N	Mean	Median	N	Mean	Median	
Underpricing	107	4.73	1.71	95	8.22	1.67	0.8820
Issue Size	107	83.55	42.00	95	89.68	48.00	0.3235
Age	103	11.12	9.00	89	18.27	10.00	3.2739***
Total assets before the offering	97	92.81	37.70	67	176.99	86.00	2.9637***
Time between	107	2.65	1.71	95	5.44	4.40	4.6226***
VC proportion	107	0.59	-	95	0.37	-	-3.1905***
High-Tech proportion	107	0.36	-	95	0.22	-	-2.233**
NASDAQ proportion	107	0.83	-	95	0.68	-	-2.4847**
Underwriter Spread	74	4.73	3.47	90	4.20	3.64	-1.1336

Note: PPE IPOs are initial public offerings by 111 U.S firms, each of which had at least one private placement of equity before its IPO. PPD IPOs are initial public offerings by 98 firms, each of which had at least one successful private placement of debt before its IPO. Panel A compares the offer and firm characteristics of the PPE IPO sample and comparison sample. Issue Size is the size of the issue excluding the potential overallotment option (in $ million). Age is the number of years between the year of formation and the year of the relative IPO. Total assets before the offering ($ million) is the value of the firm's total assets at the fiscal year-end preceding its IPO. VC proportion is the proportion of IPOs which were backed by venture capital firms. High-Tech proportion is the proportion of firms considered to be in the "High-Tech" industry following the classification methods in Loughran and Ritter (2004).[6] NASDAQ proportion is the proportion of firms that carried out an IPO on the NASDAQ exchange in comparison to NYSE. Underwriter Spread is the as the underwriter fee as a percentage of the issue size excluding the potential overallotment. The t-statistic tests whether the mean values of the variables or the percentage of the sample where relevant are significantly different between the PPE/PPD IPOs and the comparison sample. Panel C compares the PPE and PPD sample (note the number of observations has decreased as the reporting is completed after excluding observations during the matching procedure)
*** Significant at 1%, **Significant at 5%, *Significant at 10%

[6] The SIC codes included are as follows: 3571, 3572, 3575, 3575, 3577, 3578, 3661, 3663, 3669, 3674, 3812, 3823, 3825, 3826, 3827, 3829, 3841, 3845, 4812, 4813, 4899, 7370, 7371, 7373, 7374, 7375, 7378, 7379

5.2 Univariate Comparison of Underpricing through Matched Sample

For the entire sample period, the underpricing of PPE IPOs averaged 4.76% and PPD IPOs averaged 8.22% compared to our control groups, which averaged 19.37% and 16.29% respectively as shown in Table 3, Panel A and B. The difference for PPEs is statistically significant at the 5% level. For all samples, the underpricing increased substantially in the years 1999 and 2000, reaching an average of 56.24% in the entire sample from 12.00% the previous year (figure 1). The increase is witnessed for both PPE and PPD IPOs who experienced a level of average underpricing of 37.4% and 73.32% respectively. This sudden surge has been documented in the past and explained by the Internet bubble period. Found by Ljungqvist and Wilhelm (2003) is that much of this astronomical increase can partially be explained by marked changes in pre-IPO ownership structure and insider selling behaviour over the period, reducing key decision maker's incentives to control underpricing. In the PPE sample, the average underpricing remains lower than that of the matched sample throughout the sub-samples, though only statistically significant in the period 2008-2014. However in the PPD sample, the average underpricing is higher during the period 2001-2007 (averaging 22.04% compared to the matched sample of 9.75%) yet without significance.

In Table 3, Panels C and D we examine whether the argument that PPs reduce underpricing by a comparison across High-Tech and Non-High-Tech companies. The main hypothesis holds here, as both groups experience less underpricing through both types of private placement, yet without significance in the case of High-Tech PPD firms. Moreover the theory regarding ex ante uncertainty is also highlighted, as across all groups High-Tech firms show signs of a larger amount of underpricing. Moreover, the largest average difference witnessed is for High-Tech firms between PPE firms and the control group, where the difference in means is around 9% and significant at 10% level. This gives the indication that PPEs are more valuable in reducing underpricing for High-Tech firms, firms that may be considered riskier due to their characteristics. There is no significant reduction in the underpricing for High-Tech firms with prior PPDs, which supports the findings of Kim and Pukthaunthong-Le (2007) who show that leverage is only a quality signal for low-tech IPOs. They relate this to the volatility in cash flows and intangibility of assets of these firms leading to higher costs of financial distress. However, this argument can be countered by the following intuition; if debt composes a quality signal, it is particularly costly for firms within High-Tech industries, which should deter low quality firms from following, making the signal even stronger. Nevertheless, the results indicate

that there are some characteristics within the High-Tech industry that make debt a less favourable signal compared to PPEs.

In summary, the results reported in all tables signify similar trends. It is indicated that both PPE IPOs and PPD IPOs experience less underpricing during their IPOs compared to their counterparts. Moreover, firms within the High-Tech sectors show tendencies of benefitting more. The results hold across different subsamples, although with variations in significance. Moreover, an additional insight is that PPE and PPD IPOs also seem to encounter lower underwriter spread as shown in Table 2 compared to the large sample of all IPOs.

Table 3. Univariate Comparison of Underpricing between PPE and PPD IPOs and Matched Sample

Panel A. Comparison by Period for PPE IPOs				
	Proportion, %	PPE IPOs Sample Underpricing, %	Matched Sample Underpricing, %	Difference in Means, t-statistics
1992-1998	48	8.99	12.66	0.9781
1999-2000	10	37.74	75.14	0.7729
2001-2007	20	5.48	3.51	-0.3192
2008-2014	23	-18.47	7.20	1.9977*
Total	100	4.76	19.37	2.0962**
Panel B. Comparison by Period for PPD IPOs				
	Proportion, %	PPD IPOs Sample Underpricing, %	Matched Sample Underpricing, %	Difference in Means, t-statistics
1992-1998	82	3.26	10.56	2.9963***
1999-2000	5	73.32	206.36	1.1670
2001-2007	7	22.04	9.75	-0.9632
2008-2014	5	1.21	25.03	1.8419
Total	100	8.22	16.29	1.4149
Panel C. Comparison by High-Tech/Non High-Tech for PPE IPOs				
	Proportion, %	PPE IPOs Sample Underpricing, %	Matched Sample Underpricing, %	Difference in Means, t-statistics
High-Tech	36	11.48	20.55	1.8927*
Non High-Tech	64	0.84	18.95	1.1533
Total	100	4.76	16.36	2.0962**
Panel D. Comparison by High-Tech/Non-High-Tech for PPD IPOs				
	Proportion, %	PPD IPOs Sample Underpricing, %	Matched Sample Underpricing, %	Difference in Means, t-statistics
High-Tech	22	11.50	14.27	1.3573
Non High-Tech	78	7.29	17.26	1.7790*
Total	100	8.22	16.29	1.4149

Note: In all panels of Table 3, underpricing is the percentage change from the offer price to the closing price on the first day of trade. In Panel C and D High-Tech firms are firms considered to be in the "High-Tech" industry following the classification methods in Loughran and Ritter (2004).[7]Matching has been completed by the use of nearest neighbour marching propensity score matching.

* Significant at the 1%, ** Significant at the 5%, * Significant at the 10%

[7] The SIC codes included are as follows: 3571, 3572, 3575, 3575, 3577, 3578, 3661, 3663, 3669, 3674, 3812, 3823, 3825, 3826, 3827, 3829, 3841, 3845, 4812, 4813, 4899, 7370, 7371, 7373, 7374, 7375, 7378, 7379

5.3 Ordinary Least Squares (OLS) Regression A) - Regression Analysis of Underpricing

We examine the underpricing of PPE IPOs and PPD IPOs by performing an ordinary least squares (OLS) regression analysis to test our main hypothesis; that by carrying out a successful private placement prior to listing, ex uncertainty is reduced leading to lower underpricing.[8] In the regression we control for acknowledged factors, stated in Section 4, that have been documented to effect underpricing. The results from the regression are displayed in Table 4, where additional variables are added in each regression. In order to correct for heteroscedasticity and lack the normality in our sample, our regression models are run estimating the standard errors using the Huber-White Sandwich Estimator. As mentioned, the issue year dummies of 1999 and 2000 have a strong significant impact on underpricing. This is in line with the level of ex ante uncertainty theory. Ritter's changing risk composition hypothesis (1984) assumes that riskier IPOs will be underpriced by more than less risky IPOs, where risk can be reflected in technological or valuation uncertainty. As the dot-com period was categorized by a large proportion of technology firms being taken public, the average underpricing should be higher in line with Ritter. A further explanation is found by Ljungqvist and Wilhelm (2003) suggesting that the astronomical increase is explained by marked changes in pre-IPO ownership structure and insider selling behaviour over the period, reducing key decision maker's incentives to control underpricing. To control for this effect an additional "IT bubble" dummy is incorporated, corresponding to issues during these two years.

Consistent with the previous results of the univariate analysis, Table 4 illustrates significant negative coefficients for both the PPE IPO dummy as well as the PPD IPO dummy, at 1% and 10% significant respectively (in regression (1)). Inconsistent to Ljungavist (2007) our results in regression (2) shows a significantly positive coefficients for Ln_Issue Size, yet not when taking into consideration the IT bubble thereafter. The variable Ln_age highlights a negative coefficient in regression (7), but turns positive in the subsequent four regressions, however insignificant in all cases. This is inconsistent with our expectations and the findings of Ljungvist (2007) and Muscarella and Vetsuypens (1989), who document a statistically significant negative relationship, which they attribute to the higher amount of publicly available information associated with older firms. In regard to the High-Tech dummy we find no significance in the coefficient in OLS regression A), which contains the matched sample as our

[8] White's test for heteroskedasticity is also computed, indicating a normal distribution for the errors.

control group. It should be noted however that firstly our two samples are rather small (107 PPE and 95 PPD observations) and secondly the High-Tech proportion is relatively small (36% in the PPE sample and 22% in the PPD sample, Panel C Table 2). Given this low number of observations, significant results are difficult to achieve. However, when carrying out the regression using all other IPOs (~ 2,500 observations) we find a positive and significant coefficient at the 1 % level for both the PPE and PPD regression (see Tables 9 and 10 in the appendix). Consequently, these companies seem to experience more underpricing, which is in line with our reasoning regarding the higher degree of uncertainty associated with technology firms. It is consistent with Stoughton and Zechner (1998) who demonstrate high underpricing for companies that encompass high benefit-to-cost ratios from monitoring, such as High-Tech firms.

Previous research has presented conflicting results in terms of the effect of VC firms on underpricing of IPOs. Megginson and Weiss (1991) show a negative correlation between initial returns and VC backed IPOs, linking this to the certifying role played by the VC firm. The dichotomous variable is positive in all regressions with 1 % significance throughout. These results go against our hypothesis regarding monitoring effects by active investors such as VC firms. However, the results are consistent with more recent research by Gompers (1996) and Lee and Wahal (2003) whose results exhibit higher underpricing for VC-backed IPOs. These authors suggest that this can be due to VC firms taking their portfolio companies public earlier.

When comparing the coefficients of the two types of private placement dummies, they show a similar size, ranging from -12.23 to -28.7 for PPE and -0.06 and -10.77 for PPD. When testing for joint significance, the null hypothesis is rejected, signifying that the two coefficients differ in size. This result does not provide support for the hypothesis based on the pecking order theory that PPD should provide a stronger quality signal than PPE. Worth noting is that there seems to be a significant difference in time between the PP and the subsequent IPO when differentiating between PPE and PPDs. As highlighted in Table 2, Panel C, PPEs have a larger median time between, amounting to 1.71 years, whereas the median of PPDs is 4.40. If one assumes the shorter period to correspond to a more "up-to-date" certification signal, as hypothesised in hypothesis H_{1D}, then the reasoning that IPOs with previous PPEs should experience a larger reduction in underpricing as the period between is shorter in most cases.

Table 4. OLS Regression of Underpricing against whether or not the firm had a prior PP in the form of equity or debt

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
PPE	-12.90***	-12.63***	-14.11***	-15.63***	-15.72***	-21.36***	-21.95***	-23.98**	-24.53**	-22.71**	-28.70**
	(4.975)	(4.859)	(4.919)	(4.979)	(4.943)	(7.232)	(7.996)	(11.08)	(11.20)	(11.07)	(13.78)
PPD	-9.403*	-10.77**	-8.043**	-7.272*	-7.115*	-8.782*	-9.338	-5.113	-5.230	-4.184	-0.0580
	(4.883)	(5.094)	(3.912)	(3.868)	(3.944)	(4.974)	(6.242)	(8.152)	(8.186)	(8.087)	(11.54)
Ln Issue_Size		5.407***	0.762	1.187	1.328	1.096	1.471	1.539	2.120	2.262	1.342
		(1.837)	(1.775)	(1.746)	(1.794)	(1.807)	(1.983)	(1.946)	(1.912)	(1.892)	(3.998)
IT Bubble			68.61***	63.80***	64.29***	64.64***	63.89***	64.02***	63.85***	65.08***	76.09***
			(23.53)	(22.95)	(22.69)	(22.64)	(22.49)	(22.42)	(22.35)	(22.57)	(26.71)
VC				11.87***	11.11***	11.60***	12.82***	12.62***	13.07***	13.03***	14.03***
				(3.011)	(3.349)	(3.517)	(3.953)	(3.927)	(4.016)	(4.133)	(4.624)
High-Tech					3.051	-3.350	-5.039	-4.982	-5.075	-5.439	-6.568
					(3.586)	(6.461)	(7.324)	(7.350)	(7.368)	(7.517)	(8.888)
int HT PPE						16.37*	15.92*	15.76*	17.51*	15.88	17.16
						(8.514)	(9.012)	(9.119)	(9.438)	(9.915)	(11.32)
int HT PPD						5.706	7.612	7.069	7.124	7.622	10.04
						(8.015)	(9.097)	(8.820)	(8.798)	(8.902)	(11.37)
Ln Age							-0.292	0.0429	0.231	1.382	3.468
							(2.219)	(3.592)	(3.593)	(3.756)	(5.215)
int Ln_age PPE								0.959	1.904	-0.603	1.716
								(4.625)	(4.595)	(4.705)	(5.580)
int Ln_age PPD								-1.786	0.0366	-1.416	0.273
								(4.027)	(4.078)	(4.155)	(5.562)
Time Between									-0.836**	-7.285**	-5.556***
									(0.418)	(2.858)	(2.123)
int Time PPE										7.425**	5.695**
										(2.924)	(2.267)
int Time PPD										6.550**	2.683
										(2.849)	(2.128)
Ln Assets											1.982
											(2.591)
Constant	17.63***	-2.820	9.580	2.975	1.832	4.386	3.589	2.775	0.208	-1.343	-9.920
	(4.071)	(6.006)	(7.649)	(7.727)	(8.180)	(8.577)	(8.339)	(9.192)	(9.127)	(8.993)	(10.68)
Observations	388	388	388	388	388	388	358	358	358	358	280
R-squared	0.017	0.032	0.191	0.209	0.210	0.215	0.220	0.221	0.223	0.233	0.271

Note: The dependent variable is the initial returns (underpricing). The PPE dummy is a dummy variable that equals one if the issue is a private placement of equity initial offering (PPE IPO), and zero otherwise. The PPD dummy is a dummy variable that equals one if the issue is a private placement of debt initial offering (PPD IPO) and zero otherwise. Ln_Issue Size is the natural logarithm of the IPO issue size ($ million), excluding the potential overallotment offer. IT bubble is a dummy variable that equals one if the IPO was carried out during the years 1999 and 2000 and zero otherwise. High-Tech is a dummy variable equal to one if the firm is considered in the "high-tech sector" as identified following the classification methods in Loughran and Ritter (2004)[1] and zero otherwise. Ln_age is a variable indicating the age of the firm, calculated as the number of years between the year of formation and the year of the relative IPO. Time between is a continuous variable calculated as the time period between the previous PP and the subsequent IPO. Ln_Assets is the natural logarithm of the dollar value of the total assets of the firm prior the IPO. VC is a dummy variable that equal to one if the firm was backed by a venture capital fund and zero otherwise. Interaction terms are added to the model, multiplying the PPE and PPD dummy with the variables the dummy variable High-Tech and the continuous variable age and time between. OLS=ordinary least squares. Standard errors are reported in brackets. *** Significant at 1%, ** Significant at 5%, * Significant at 10%

5.4 Sub-Hypotheses

5.4.1 Testing Hypotheses, H_{1B}, H_{1C} and H_{1D}

In order to test sub-hypotheses H_{1B}, H_{1C} and H_{1D}, interaction variables are created between our PPE/PPD dummies and: 1) the age variable (creating *int_age PPE/PPD*), 2) the High-Tech dummy (creating *int_HT PPE/PPD*) and 3) the time between variable (creating *int_timePPE/PPD*). These interaction variables are then incorporated in our regression.

Hypothesis H_{1B} suggests that PPs are more valuable for younger firms. The hypothesis is based on the assumption that younger firms are associated with a higher degree of uncertainty as available information for these firms may be more limited. Thus, the relative strength of a PP signal should be stronger for younger firms. If this hypothesis holds we expect the coefficients of both interaction variables *int_age PPE* and *int_age PPD* to be positive and significantly different from zero. As shown in regression (7), the age of the firm is negatively correlated with initial returns, potentially due to the lessening of information asymmetry and ex uncertainty as previously argued (note however the lack of significance). The coefficients of *int_age PPE* and *int_age PPD* show mixed signs. When the Wald test is carried out in order to test whether the coefficient is equal to zero, the null hypothesis that they are equal to zero cannot be rejected. Thus, our hypothesis cannot be confirmed.

Hypothesis H_{1C} contends that PPs have a relatively stronger effect in reducing underpricing for High-Tech firms compared to non-High-Tech firms. This hypothesis is derived from the assumption that these industries, due to their nature as previously argued, are assumed to carry a higher degree of ex ante uncertainty. Consequently the relative strength of the PP signal should be stronger. Given this reasoning we expect the coefficients of the variables *int_HT PPE* and *int_HT PPD* to be negative and significantly different from zero. Conversely, Kim and Pukthaunthong-Le (2007), distinguish the signalling effect of leverage between High-Tech and non-High-Tech IPOs, arguing that more traditional, "low-tech" industry firms benefit to a higher extent of using debt in their capital structure as their assets are commonly considered more tangible and potentially easier to liquidate in the need for capital raising. If one assumes High-Tech firms in general have a positive correlation with underpricing, then in line with Kim and Pukthaunthong-Le, the *int_HT PPD* coefficient should be positive whereas the *int_HT PPE* coefficient should be negative. Our results in the univariate analysis regarding High-Tech firms in Table 3 highlight the larger degree of underpricing for High-Tech firms, and show indications that High-Tech firms benefit more from a previous PP. However, when analyzing the

interaction variables little support is provided for our sub-hypothesis as the coefficient of *int_HT PPE* is positive and significant while the *int_HT PPD* being negative and insignificant. When all control and explanatory variables are added the coefficient show no significance.

Hypothesis H_{1D} speculates that the shorter the time between the previous PP and IPO, the more "up-to-date" the signalling, thus the stronger the certification. In line with the certification hypothesis, our results highlight positive and significant coefficients (at 5% level) for these variables in regression (10) indicating the advantage of completing PPs within close proximity to the intended IPO.

5.4.2 Ordinary Least Squares (OLS) Regression B) - Regression on Underwriter Spread against whether or not the Issue had a previous private placement (equity or debt)

In order to test sub-hypothesis H_{2B}; that PPs reduce the explicit costs as the result of increased monitoring by a concentrated amount of investors, we measure the influence of previous PPs on the compensation paid to the underwriter. This is done by using the underwriter spread (underwriter fee as a percentage of the total issue size excluding overallotment option), as the dependent variable and *Ln Issue Size*, *VC*, *Ln Age* and *Ln Assets* as other explanatory variables.

As shown in Table 5, both the PPE and PPD dummy are negative and significant at 5% and 1% level in regression (2) when taking into consideration the size of the issue. The results arguably show slight indication that prior PPs, may reduce monitoring needs, leading to a lower fee demanded by the underwriter. Consistent with Ritter (1987), a negative correlation between issue size and underwriter spread is highlighted. Ritter affirms this relationship to the effect of economies of scale going public. The negative and significant (at 10%) VC dummy has been documented previously by Megginson Weiss (1991) who argue that VC firms reduce the information asymmetry between both potential investors and underwriters, by lowering the underwriter costs of for example due diligence. However, noteworthy is that both the PPE and PPD dummy remain significant at the 10% and 1% level respectively even after controlling for the effect of VC backing. Significance is lost after adding the variable *Ln Assets* potentially due to the reduction of observations and lack of quality of the variable from the SDC database.

The results from both OLS Regression A and B show indications that the existence of prior PPs may have a certification effect on the issuing firm, affecting the investors in the subsequent IPO and underwriters alike. Consequently, PP's may lower both the implicit cost (underpricing) as well as the explicit cost (underwriter compensation) of going public.

Table 5. OLS Regression of Underwriter Spread against whether or not the firm had a previous private placement in the form of equity or debt

Regression	(1)	(2)	(3)	(4)	(5)
PPE	-0.0786	-0.0538**	-0.0450*	-0.0501*	-0.0431
	(0.0504)	(0.0266)	(0.0271)	(0.0294)	(0.0344)
PPD	-0.132***	-0.0541***	-0.0570***	-0.0622***	-0.0386
	(0.0412)	(0.0202)	(0.0205)	(0.0222)	(0.0283)
Ln Issue_Size		-0.329***	-0.331***	-0.332***	-0.345***
		(0.0210)	(0.0212)	(0.0223)	(0.0292)
VC			-0.0374*	-0.0279	-0.0228
			(0.0222)	(0.0231)	(0.0291)
Ln Age				0.0204*	0.0171
				(0.0107)	(0.0143)
Ln Assets					-6.96e-03
					(0.0129)
Constant	0.552***	1.78***	1.80***	1.76***	1.84***
	(0.0308)	(0.0877)	(0.0913)	(0.0950)	(0.120)
Observations	319	319	319	292	222
R-squared	0.027	0.717	0.720	0.719	0.708

Note: The dependent variable is the underwriter spread (defined as the underwriter fee as a percentage of the issue size excluding the potential overallotment). The PPE dummy is a dummy variable that equals one if the issue is a private placement of equity initial offering (PPE IPO), and zero otherwise. The PPD dummy is a dummy variable that equals one if the issue is a private placement of debt initial offering (PPD IPO) and zero otherwise. Ln_Issue Size is the natural logarithm of the IPO issue size ($ million), excluding the potential overallotment offer. VC is a dummy variable that equal to one if the firm was backed by a venture capital fund and zero otherwise. Ln_age is a variable indicating the age of the firm, calculated as the number of years between the year of formation and the year of the relative IPO. Ln_Assets is the natural logarithm of the dollar value of the total assets of the firm prior the IPO. OLS=ordinary least squares. Standard errors are reported in brackets.

*** Significant at 1%, ** Significant at 5%, * Significant at 10%

6 Robustness Checks

6.1 VC Backed IPOs

IPOs backed by VC firms have been proven to have an effect on underpricing in numerous studies many supporting the underlying VC certification/monitoring model. Literature documents contradicting impacts of this underpricing effect, nevertheless, the risk remains that our sample and matched IPOs may be distorted by this factor; hence we carry out a robustness test to filter out issuing firms backed by VC's, which are identified using the SDC database.

In Table 6 we exclude VC- backed IPOs and report the results from an OLS Regression. After filtering our data, both the PPE and PPD dummies remain negative and significant at a 1% level in the first four regressions. However, after further control and explanatory variables are added, significance is lost. The uncontaminated PPE and PPD sample amounts to 45 and 63 respectively. Overall, the magnitude of the coefficients generated are similar to OLS Regression A) where VC firms are included. Analogous to the previous case, the PPE dummy highlights a more negative coefficient when compared to its debt counterpart. The outcome suggest that our results regarding the mitigating effects of prior PPs of both equity and debt are not primarily driven by existence of VC firms but may have an impact.

Table 6 OLS Regression of Underpricing against whether or not the firm had a prior PP in the form of equity or debt filtering out VC firms

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PPE	-16.80***	-15.93***	-15.89***	-16.63***	-17.14***	-16.32***	-19.44	-19.59	-14.54	-14.22
	(4.836)	(4.743)	(4.751)	(4.795)	(5.817)	(5.965)	(13.16)	(13.26)	(12.76)	(15.85)
PPD	-6.491**	-6.995***	-7.111***	-7.089***	-4.700	-3.803	3.366	3.649	3.835	15.81
	(2.623)	(2.609)	(2.636)	(2.691)	(2.860)	(3.426)	(9.030)	(9.059)	(9.133)	(14.82)
Ln Issue_Size		1.730	1.876	2.402	2.255	2.998	3.172	3.460	3.418	5.770
		(1.852)	(1.888)	(1.906)	(1.969)	(2.190)	(2.156)	(2.297)	(2.320)	(4.145)
IT Bubble			-5.749*	-4.541	-4.127	-3.618	-4.417	-3.965	-7.735*	3.189
			(3.366)	(3.446)	(3.657)	(3.571)	(3.428)	(3.235)	(4.096)	(8.041)
High-Tech				9.586**	13.30*	10.65	10.59	10.57	10.35	17.88
				(4.300)	(7.991)	(8.470)	(8.552)	(8.599)	(8.658)	(14.02)
int HT PPE					0.133	1.207	1.888	2.559	-4.108	-10.27
					(10.30)	(10.68)	(10.98)	(11.12)	(10.93)	(16.64)
int HT PPD					-15.19*	-12.89	-14.33	-14.43	-14.45	-21.27
					(8.560)	(9.191)	(9.297)	(9.319)	(9.377)	(14.85)
Ln Age						-1.158	-0.500	-0.463	-0.260	1.457
						(1.772)	(2.953)	(2.962)	(3.022)	(4.151)
int Ln_age PPE							1.266	1.547	-3.414	-2.616
							(4.723)	(4.800)	(5.642)	(6.551)
int Ln_age PPD							-2.802	-2.224	-1.944	-3.225
							(3.316)	(3.352)	(3.415)	(5.195)
Time Between								-0.311	-0.809	-52.46*
								(0.204)	(0.753)	(28.31)
int Time PPE									4.775**	57.15**
									(2.131)	(28.45)
int Time PPD									0.309	50.35*
									(0.715)	(28.55)
Ln Assets										0.922
										(2.514)
Constant	9.129***	2.413	2.013	-1.662	-1.722	-2.541	-4.390	-5.557	-5.561	-24.17**
	(2.401)	(8.149)	(8.223)	(8.244)	(8.208)	(8.663)	(9.551)	(9.999)	(10.19)	(10.65)
Observations	206	206	206	206	206	187	187	187	187	138
R-squared	0.083	0.089	0.091	0.117	0.129	0.126	0.131	0.133	0.151	0.212

Note: The dependent variable is the initial returns (underpricing). The PPE dummy is a dummy variable that equals one if the issue is a private placement of equity initial offering (PPE IPO), and zero otherwise. The PPD dummy is a dummy variable that equals one if the issue is a private placement of debt initial offering (PPD IPO) and zero otherwise. Ln_Issue Size is the natural logarithm of the IPO issue size($ million), excluding the potential overallotment offer. IT bubble is a dummy variable that equals one if the IPO was carried out during the years 1999 and 2000 and zero otherwise. High-Tech is a dummy variable equal to one if the firm is considered in the "high-technology sector" as identified following the classification methods in Loughran and Ritter (2004)[1] and zero otherwise. Ln_age is a variable indicating the age of the firm, calculated as the number of years between the year of formation and the year of the relative IPO. Time between is a continuous variable calculated as the time period between the previous PP and the subsequent IPO. Ln_Assets is the natural logarithm of the dollar value of the total assets of the firm prior the IPO. Interaction terms are added to the model, multiplying the PPE and PPD dummy with the variables the dummy variables High-Tech and the continuous variable age and time between. OLS=ordinary least squares. Standard errors are reported in brackets. *** Significant at 1%, ** Significant at 5%, * Significant at 10%

7 Conclusion

By studying the IPO underpricing of firms with prior PPEs or PPDs to that of those without, this thesis contributes to the limited research on PPs conducted by private firms and their effect on IPO underpricing in the cases where they successively go public. Our findings indicate that firms that have carried out successful PPs of both equity and debt may face a lower degree of underpricing during their subsequent IPOs.

The results could be interpreted as support for the hypotheses that PPs act as a certification signal as well as monitoring tool. A successful PP implies that a number of investors consider the firm an appropriate investment, which can be viewed as an endorsement of the firm. Consequently, PPs could be interpreted as a quality signal, mitigating the effect of information asymmetry and associated risk for investors. Additionally, firms with PPs encompass the monitoring benefit of a concentrated number of accredited investors, which arguably could improve the efficient use of corporate resources, further reducing the uncertainty in regard to firm quality. Thus, we argue that the aforementioned mechanisms reduce the level of ex ante uncertainty regarding the firm value and thus lower the required degree of underpricing, in accordance with Beatty and Ritter (1986).

We compare a sample of 107 IPOs with prior PPEs and a sample of 95 IPOs with prior PPD to two respective control groups, matched by industry, issue year and issue size. The study is limited to US firms during the time-period 1992-2014. The main hypothesis; that underpricing is lower for firms that have performed a PP, appear to withstand across various time periods and for both High-Tech and Non High-Tech firms, although with varying significance.

In the regression of the entire IPO sample, we observe that High-Tech firms are underpriced to a significantly larger degree compared to non-High-Tech firms, providing support for the assumption that High-Tech firms are associated with higher level of uncertainty. However, this relationship is not confirmed when reducing the regression to the two PP samples with their matched control groups. Consequently, we find no support for the hypothesis that the effect from having conducted a PP is stronger for High-Tech firms. It should be noted that these insignificant results are not unexpected given the small number of observations of High-Tech PP firms.

Strong support is provided for the hypothesis that the certification signal is stronger the closer the PP is to the IPO. A probable explanation is that the investment decision of the PP is based on more up-to-date and relevant information, possibly strengthening the certification

signal. However, no support is found for the sub-hypothesis that PPs are more valuable for younger firms. The hypothesis that active investors such as VC firms increase monitoring which decreases underpricing is not confirmed. This could potentially be explained by the reasoning drawn by Gompers (1996) and Lee and Wahal (2003) who suggest that the opposite effect is due to VC firms taking their portfolio companies public earlier.

Furthermore, the results indicate that PPs may additionally to reducing the implicit costs of going public – underpricing – also reduce the explicit costs in form of reduced underwriter spread. Arguably, the existence of a concentrated amount of investors in PP IPOs may lessen the lead bank's monitoring efforts, consequently lowering the required underwriter spread. This could be interpreted as support for the theory that PPs may improve monitoring, although the assumptions could be questioned.

Finally, our results indicate that firms with prior PPEs may be less underpriced than those with prior PPDs. This is inconsistent with the hypothesis that debt should constitute a stronger certification signal, in line with the pecking order theory. However, these results could just as well be a result of biases, as the two samples are not matched and thus not controlled for other explanatory factors. For instance, in our sample PPEs are on average conducted much closer in time to IPOs than PPDs. As documented in our analysis, closer proximity between the PP and the IPO seem to strengthen the effect of the certification signal. Hence, solely based on these tests adequate evidence cannot be attained for the notion that one of the two forms of PPs reduces underpricing more.

In conclusion, we find support for the hypothesis that PPs of equity and debt conducted before IPOs may reduce underpricing when the firms go public. We suggest that PPs may constitute a signal of quality as well as improved monitoring, which reduces the level of ex ante uncertainty and thus the underpricing. In addition, we find that the effect on underpricing is stronger when the PP is carried out closer in time to the IPO. If our results can be confirmed by future research this may have implications on the financing choice of future firms. Provided that the benefits of reduced implicit (underpricing) and explicit cost (underwriter spread) of going public are larger than the costs of issuing a PP[9], PPs may become a more common financing tool for companies on their journey towards going public.

[9] Such as price discount, legal fees and other direct costs associated with negotiation with potential investors

8 Limitations and Future Research

8.1 Limitations in Interpreting the Results

Our primary limitation in regard to our data collection and research stems from the lack of disclosure requirement for PPs. This could potentially causes biases in our samples, as we have only studied firms that have disclosed their PPs. Furthermore, data limitations inhibited us from testing several interesting sub-hypotheses. In particular, testing hypotheses regarding the monitoring argument was unfeasible, such as testing the impact of different investor types and number of participants. Furthermore, except from the VC variable we introduce no specific proxy for active investors. Our attempt to test the monitoring argument indirectly by performing a regression on underwriter spread could be considered far-fetched as it is based on a series of assumptions. It requires the assumption that PPs increase monitoring, and furthermore that increased monitoring leads to decreased explicit costs.

Moreover, the PPE and PPD sample collected is of a relatively small size, forcing us to limit our matching criteria. For instance merely the first number of the SIC code was used, rather than two or more. Disturbances in our data is carried out to a certain extent by the matching procedure, nevertheless, accountancy is not taken for other types of debt for the control firms which could cause distortions in our analysis. The variable where we were unable to find the most data was information regarding total assets before the offering, potentially causing biases in our data due to missing values. Moreover, when manually complementing some of the data acquired through SDC with relevant SEC filings, we occasionally discovered errors within the SDC data, in particular regarding total assets. We do not expect this to have a big impact on the results, although it could potentially have caused some noise in the regressions.

Furthermore, our contribution to academic research would have been greater if we had managed to perform adequate matching between the PPE and PPD sample, yet we were restricted by the low number of observations.

Lastly, it should be emphasized that our study only covers the US IPO market and that the conclusions might not be applicable elsewhere due to differences in legislation and divergences in practices between countries.

8.2 Suggestions for Future Research

As stated in the introduction, very little research has been conducted on PPs prior to IPOs, in particular concerning PPEs, probably due to the limited data. This of course calls for thorough tests of our results, possibly with a more extensive data set. In addition, we highlight three more specific areas suitable for future research:

As mentioned in the limitation section above, our comparison between underpricing of PPE IPOs and PPD IPOs is inadequate, as the two samples are not matched due to the limitations of our data. To our knowledge there is no research on this topic and it would certainly make an interesting field of research.

Furthermore, due to the stated limitations of our data, the test of the monitoring argument is far from perfect. An interesting field would therefore be to analyse the effects on underpricing of PPs more in the light of the ownership structure, such as investor concentration, the reputation of the investors and the management ownership.

Lastly, if our findings; that PPs help reduce underpricing and underwriter spread, can be confirmed by future research, a tradeoff relationship between the mentioned benefits and the cost of PPs can be establish. This introduces the possibility of creating a model mirroring this tradeoff. Even though the coefficients of such a model would probably differ depending on different firm characteristics, it could provide understanding of firms' financing decisions, and possibly also guidance to future firms.

As in our case, the biggest obstacle for all these suggestions for future research is the lack of data. However, if this hurdle can be overcome, the potential findings may make the effort worthwhile.

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Appendix

Table 7 Comparison of firm characteristics after matching

Variables	PPE sample	PPE mached sample	Differnce in means, t-statstic	PPD sample	PPD matched sample	Differnce in means, t-statstic
Underpricing	4.76	19.37	2.0962**	8.22	16.29	2.9963***
Issue Size	84.78	83.49	0.0006	87.62	97.29	0.2080
Total assets before the offering	79.13	86.61	0.3034	178.74	118.12	-1.8833*

Note: The matching procedure is carried out through the nearest neighbour matching technique with propensity score matching. Firms are matched on the criteria; of the same issue year, industry (based on the first number of the SIC code) and of similar issue size. No matches are found for four observations in the PPE sample, reducing the sample to 107 observations. No matches are found for three observations in the PPD sample, reducing the sample to 95 observations.
*** Significant at 1%, **Significant at 5%, Significant at 10%

Table 8 Correlation matrix across variables

	Ln_Issue Size	IT Bubble	Ln_Assets	VC	High-Tech	Ln_age
Ln_Issue Size	1.0000					
IT Bubble	0.2557	1.0000				
Ln_Assets	0.7982	0.0107	1.0000			
VC	0.1910	0.2266	0.1630	1.0000		
High-Tech	-0.0053	-0.0741	-0.0229	0.1691	1.0000	
Ln_age	0.0136	-0.0832	0.0289	-0.0984	0.0811	1.0000

Note: The correlation matrix presents coefficients across selected variables included in OLS regression A

Table 9 OLS Regression on Underpricing against whether or not the firm had a prior PPE all other IPOs as the control group

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PPE	-10.11***	-10.12***	-10.79***	-11.40***	-11.53***	-12.76***	-13.75***
	(2.963)	(2.911)	(2.770)	(2.731)	(2.681)	(2.922)	(3.179)
Ln Issue_Size		1.859***	0.698	0.823	1.248*	2.744***	4.347***
		(0.672)	(0.626)	(0.645)	(0.660)	(0.763)	(1.436)
IT Bubble			41.28***	40.46***	38.82***	34.75***	34.16***
			(5.767)	(5.749)	(5.705)	(5.839)	(6.066)
VC				4.336***	2.434*	3.762**	2.675
				(1.341)	(1.344)	(1.629)	(2.001)
High-Tech					9.356***	10.15***	11.27***
					(1.605)	(1.999)	(2.317)
Ln Age						-1.100	-1.944
						(1.006)	(1.224)
Ln Assets							-0.139
							(0.978)
Constant	14.86***	7.952***	9.052***	6.697**	3.091	-1.355	-5.543
	(0.710)	(2.601)	(2.482)	(2.889)	(3.006)	(4.327)	(4.742)
Observations	2,505	2,505	2,505	2,505	2,505	1,453	1,136
R-squared	0.003	0.007	0.109	0.113	0.128	0.135	0.162

Note: The dependent variable is the initial returns (underpricing). The PPE dummy is a dummy variable that equals one if the issue is a private placement of equity initial offering (PPE IPO), and zero otherwise. Ln_Issue Size is the natural logarithm of the IPO issue size ($ million), excluding the potential overallotment offer. IT bubble is a dummy variable that equals one if the IPO was carried out during the years 1999 and 2000 and zero otherwise High-Tech is a dummy variable equal to one if the firm is considered in the "high-technology sector" as identified following the classification methods in Loughran and Ritter (2004)[1] and zero otherwise. Ln_age is a variable indicating the age of the firm, calculated as the number of years between the year of formation and the year of the relative IPO. Ln_Assets is the natural logarithm of the dollar value of the total assets of the firm prior the IPO. OLS=ordinary least squares. Standard errors are reported in brackets.
*** Significant at 1%, ** Significant at 5%, * Significant at 10%

Table 10 OLS Regression on Underpricing against whether or not the firm had a prior PPD all other IPOs as the control group

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PPD	-7.334***	-7.580***	-6.287***	-6.037***	-5.471**	-6.596**	-3.774
	(2.799)	(2.799)	(2.368)	(2.337)	(2.355)	(3.192)	(4.650)
Ln Issue_Size		0.903	-0.123	-0.0344	0.225	1.252	3.549**
		(0.718)	(0.683)	(0.698)	(0.712)	(0.799)	(1.483)
IT Bubble			42.35***	41.52***	40.16***	35.61***	35.64***
			(6.591)	(6.581)	(6.594)	(7.027)	(7.309)
VC				4.519***	2.979**	4.050**	2.759
				(1.478)	(1.497)	(1.765)	(2.095)
High-Tech					6.913***	7.107***	7.608***
					(1.746)	(2.065)	(2.334)
Ln Age						-1.146	-2.204
						(1.114)	(1.371)
Ln Assets							-0.701
							(1.017)
Constant	15.56***	12.16***	12.78***	10.55***	8.049**	5.924	1.255
	(0.779)	(2.858)	(2.745)	(3.129)	(3.264)	(4.707)	(5.047)
Observations	2,120	2,120	2,120	2,120	2,120	1,199	927
R-squared	0.002	0.003	0.105	0.110	0.118	0.112	0.140

Note: The dependent variable is the initial returns (underpricing). The PPE dummy is a dummy variable that equals one if the issue is a private placement of equity initial offering (PPE IPO), and zero otherwise. Ln_Issue Size is the natural logarithm of the IPO issue size ($ million), excluding the potential overallotment offer. IT bubble is a dummy variable that equals one if the IPO was carried out during the years 1999 and 2000 and zero otherwise High-Tech is a dummy variable equal to one if the firm is considered in the "high-technology sector" as identified following the classification methods in Loughran and Ritter (2004)[1] and zero otherwise. Ln_age is a variable indicating the age of the firm, calculated as the number of years between the year of formation and the year of the relative IPO. Ln_Assets is the natural logarithm of the dollar value of the total assets of the firm prior the IPO. OLS=ordinary least squares. Standard errors are reported in brackets.
*** Significant at 1%, ** Significant at 5%, * Significant at 10%